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CLINICAL ASPECTS OF VASCULAR REACTIVITY

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RECENT YEARS have seen the closing of large gaps in our understanding of the vasomotor activity of the peripheral circulation. However, as is the case in every branch of medicine, the gathering of new facts has been associated with the unveiling of at least as many new unknown facets of the same problems. We had been aware that as part of the circulatory economy the blood flow through the skin and muscle is regulated independently, but recent work has demonstrated that there are significant differences in the vasomotor control of different areas of the skin, such as the hand and the forearm.

Our present concept of the reflex vasomotor control of the peripheral circulation may be summarized as follows:

CUTANEOUS VESSELS

The vasodilatation in the skin of the hand and forearm that occurs on raising body temperature is transmitted by sympathetic fibers. In the fingers and hand, this is brought about by the release of vasoconstrictor tone (3, 19, 25, 47, 51), but in the forearm it is mainly the result of an active vasodilator mechanism linked with cholinergic sympathetic pathways (15, 34, 47), the release of vasoconstrictor tone playing a minor part (47). The reluctance generally felt of accepting an active vasodilator mechanism has been greatly overcome by evidence supplied by Fox and Hilton to the effect that vasodilatation of the skin of the forearm is the result of secretomotor rather than true vasodilator nerve activity. They have demonstrated that during sweat gland activity, a bradykinin-forming enzyme appears in the sweat, and bradykinin is formed in the skin of the forearm. They conclude that the vasodilatation in the skin of the human forearm which accompanies body heating is produced in the main by bradykinin (a polypeptide with vasodilator properties), resulting from sweat gland activity.

The formation of bradykinin, however, is not confined to the skin of the forearm but has also been observed in the sweat collected from the hand. This observation poses a problem since to date no proof has been forthcoming of an active vasodilator mechanism on body heating in the vessels of the hand or the fingers (46) and it is generally agreed that vasodilatation in the hand is the result of release of vasoconstrictor tone only.

The sympathetic vasodilators in the fingers that were originally described by Lewis and Pickering have never really been verified, since the experiments of this research team could not be duplicated by other investigators in this field.

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VESSELS OF MUSCLE

Present evidence suggests that the muscle vessels of the forearm have a dual nerve supply, vasoconstrictor and vasodilator (5, 6, 45). The release of the vasomotor tone in the muscle vessels does not play any role in the vasodilatation resulting from body heating as has been shown by numerous methods (4, 38, 44), but it is involved in the reflex changes observed with alteration in posture (43) and the vasodilatation recorded with receptor activity in the low pressure side of the circulation with intrathoracic pressure changes (48). We shall have to refer to this in more detail later. Both raising the legs and resisted breathing cause reflex vasodilatation in arm muscles because of the release of vasoconstrictor tone dependent on the shifting of blood to the intrathoracic vascular bed. However, compared with the changes in blood flow brought about by exercise, the changes produced by dilatation from the release of vasoconstrictor tone of the muscle vessels are very modest. Whereas exercise will raise the total forearm flow from a resting volume of about 3 milliliters to 30 milliliters per 100 milliliters tissue per minute, blocking of the deep nerves to the forearm increases the blood flow only to about 7 milliliters per 100 milliliters tissue per minute. Although evidence for a vasodilator supply of skeletal muscle vessels seems well documented in animals (10, 56), we know little about its functional significance. It does not seem to be involved in blood pressure control but possibly plays its part in so-called alarm reactions. Evidence of its existence in man is by no means compelling and, in keeping with the foregoing, it seems to be involved in the reaction to fainting (6).

PERIPHERAL CONTROL AND CENTRAL RECEPTORS

The concept of reflex control of muscle bloodflow by receptors in the low pressure system is rapidly being accepted. Reflex vasodilatation in the muscle vessels has been shown to occur whenever central venous pressure is raised as by passively raising the legs in a recumbent person, or when the transmural pressure in the receptor area is increased as by lowering the intrathoracic pressure. Since this increase in the forearm flow does not occur in the sympathectomized limb or when the nerves are blocked, it is safe to assume that it is brought about by reflex mechanisms, probably by ablation of vasoconstrictor tone from the muscle vessels. By virtue of these reflex changes it is possible under conditions which produce a marked increase in venous return, such as exercise, to have a large increase in cardiac output without incurring a corresponding increase in the load on the cardiac muscle.

With a clearer understanding of the reflex control exerted by receptors in the low pressure system on the peripheral (muscle) circulation our concept of the regulating influences of the arterial baroreceptors is undergoing changes. Present views hold that the control of the blood pressure from arterial baroreceptors and chemoreceptors is accomplished by way of changes in vasoconstrictor tone. Since Roddie and Shepherd recently have demonstrated that the rise in blood pressure from clamping both carotid arteries is not associated with an increase in peripheral resistance in the human forearm, it has to be concluded that any increase in peripheral resistance caused by a decrease in the caliber of blood vessels must occur in vessels other than those of the limbs.

The peripheral vasoconstriction induced by occlusion of both carotid arteries affects the peripheral veins (50) as well as the arteries.

From the evidence presented, three points emerge:

1. The two mechanisms of heat exchange in man, namely, skin vasodilatation and sweat secretion, are interrelated to a greater degree than hitherto believed and are not to be considered functionally independent and of separate peripheral neural control.

2. Although both the skin and muscle vessels of humans are innervated by sympathetic fibers, the vasomotor centers controlling these vessels can function independently.

3. Reflex activity of the vessels of the skin serves mainly as body temperature control and blood pressure homeostasis, whereas reflex activity of the muscle vessels is involved in the control of the hemodynamic changes occurring with alterations in posture.

SPONTANEOUS TONUS ADJUSTMENTS

Normally, the peripheral vessels are neither fully dilated nor fully constricted, but steer a middle course determined by the vasomotor centers. The changes in the height of the pulse volume recorded in the digital plethysmogram serve as an exquisite indicator of these central tonus adjustments which commonly are of insufficient degree to reveal themselves in blood

pressure changes. In fact, the height of the pulse volume is in a state of continuous rhythmic fluctuation, controlled both by central and local vasomotor activity (25).

Because of the proximity of the respiratory center, respiratory fluctuations are often imposed upon the stream of sympathetic vasomotor impulses resulting in volume changes simultaneous with the respiratory cycle.

Vasomotor impulses reach the peripheral vessels with any untoward stimulus such as pain, cold, or auditory stimuli. Similarly, a yawn, a deep breath, and mental activity are associated with peripheral vasoconstriction (24, 25). All these changes are independent of blood pressure changes and absent in the sympathectomized extremity. They are, therefore, of a true reflex nature. With the limb in the dependent posture all changes in digital volume, both spontaneous and those induced by extrinsic and intrinsic stimuli, are greatly diminished. In the elevated position they are very much pronounced (29). Although receptors in the lungs have been suggested as the cause of vasoconstriction following a yawn or a deep inspiration, receptors in the diaphragm, the chest wall, and the abdomen are difficult to exclude.

The absence of these constrictor responses provides proof that the sympathetic pathways have been effectively interrupted, be it spontaneously by the underlying disease, such as diabetes or poliomyelitis (31), or therapeutically as by sympathectomy or paravertebral block.

Whereas we know of numerous examples of spontaneous changes in vascular tone resulting from central tonus adjustments affecting the skin vessels, Golenhofen and Hildebrandt have recently produced evidence of spontaneous, rhythmic changes in the muscle circulation. By means of Hensel's heat-conducting probe continuous determinations were made of the circulation in the skin and muscles of the forearm or calf of healthy young adults. Spontaneous, rhythmic changes were found in the blood flow to the muscle, the amplitude being up to 50 or even 100 per cent of the resting circulation. The fluctuations were accompanied by synchronous, contrary fluctuations of the circulation in the skin. The authors are of the opinion that the changes are caused by fluctuations in sympathetic tone, and are not a mere passive result of variations in the blood pressure or shifting of the blood within the limb.

It has been noted that not only the untoward stimulus itself but the anticipation of it will induce spontaneous vasoconstriction (25). This observation has been applied rather ingeniously by Winsor in order to produce conditioned vasoconstrictor reflexes. He was subsequently able with certain drugs to block the latter without interfering with the vasomotor reaction resulting from the primary stimulus. This interesting experiment opens up a new field of investigation of the mode of action of hypnotic and sedative drugs and may also be applicable to problems concerning the etiology and treatment of the vasomotor phenomena in functional vascular disorders, such as Raynaud's disease.

HEMODYNAMICS AND CRITICAL CLOSING PRESSURE

Our present views on hemodynamics cannot fully explain the pressure-flow relationship observed in the animal circulation. Frank expressed the relationship between arterial flow and pressure as resistance and based his formula on Poiseuille's law.

Poiseuille elaborated his formula for laminar, uniform flow of simple fluids in nondistensible cylindrical tubes, a poor analogue of the mammalian circulation which presents us with a pulsating stream of a complex suspension in a conical system of elastic tubes.

Wezler and Sinn pointed out that the elasticity of the vascular system is the cardinal factor which prohibits direct adaptation of Poiseuille's law to the mammalian circulation. They, therefore, modified it to include the elasticity of the vascular bed and arrived at what they call the "Strömungsgesetz" of the circulation.

McDonald and Womersley who re-examined pressure and flow in a dog's femoral artery point out that the oscillating arterial pressure gradient was related to the phasic changes in volume flow in the same way in which an alternating voltage is related to the corresponding current. Womersley has, therefore, devised an alternating current theory of flow as opposed to flow that obeys Poiseuille's law and which may be termed the direct current theory of flow. It follows that under conditions of branching we cannot speak of the sum of resistances and apply Ohm's law. With an oscillating pressure the effect of branching involves impedances. It is in this respect that the methods developed by Burch of recording volume changes simultaneously with its first and second derivatives, i.e., the time course of the

inflow and outflow rate and the acceleration rate of the blood inflow, offer an exciting new method of examining the conditions prevailing in man.

It is to the merit of Burton (12) that he has drawn attention to the mathematical relationship which exists between the tension in the wall of the blood vessels and the pressure within. Normally, they are in a state of equilibrium following LaPlace's law.

From considerations of LaPlace's law on the equilibrium of cylindrical tubes Burton predicted that if the pressure across the wall of a small blood vessel should fall below a certain (critical) level, the vessels would close. Evidence of the existence of a "critical closing pressure" has been obtained both in animal and human experiments.

From LaPlace's formula, it is evident that unlike the peripheral resistance, the critical closing pressure is independent of the viscosity. It is also evident that in the smaller vessel the tension of the wall has a mechanical advantage over the pressure in its lumen, which means that with decreasing size of the vessel the critical closing pressure will rise.

Application of LaPlace's formula has stimulated research on the structure and function of the various components of the arterial wall (13, 53). Schönbach and Langendorf have carried out extensive measurements of the lumina and the thickness of the wall of living vessels with the phase contrast microscope. Whereas Schiele-Wiegandt had found earlier that there was a relative increase in the thickness of the wall (D) from the center to the periphery, Schönbach and Langendorf noted great changes from one part of the arterial tree to the next. The r:D ratio (internal radius: thickness of the wall) for the great arteries and veins varied between 6: 1 and 8: 1, whereas in the region of the arterioles it is 2: 1. In the capillaries it rises to 10: 1 and more.

The importance of these measurements in determining the tension in various sectors of the arterial tree according to LaPlace's formula and for calculating the work required to contract the vessels in the control of the peripheral resistance is pointed out by the authors. A curve showing the tension along an arterial segment would show elevations and depressions determined to a large extent by the r:D ratio and the pressure within the vessel.

In this connection conditions found in the giraffe are of considerable interest. Arteries from various parts of the animal's body showed, on histological examination, wide variations which were considered to reflect hydrostatic pressure differences (30, 32). The enormous development of the muscularis in the leg vessels of this species fits in well with Burton's ideas with regard to the role played by the different structures of the arterial wall and ascribing that of the smooth muscle to producing active tension under various conditions.

It has been shown by Gaskell and Krisman that the critical closing pressure is a measure of vasomotor tone and by Burton (12, 13) that it is raised in proportion to the constrictor fiber discharge. Thus it is increased by body cooling and decreased by body heating or anesthesia of the respective nerves. It is higher in patients with hypertension, indicating that the increased resistance is the result of an unusually high constrictor tone of the smaller vessels.

Application of this concept to our clinical thinking will do much to clarify misconceptions about the underlying pathophysiology of many clinical states and the evaluation of therapeutic procedure. Even slight changes in blood pressure may compromise the peripheral blood flow in cases of organic arterial disease. If the blood pressure is lowered, as in bleeding, even slight changes in vasoconstrictor tone may produce a shut-down of certain areas. The shut-down associated with an arterial embolus usually attributed to severe vasomotor spasm is readily explained by the fall in intra-arterial pressure distal to the block below the critical closing pressure.

SHUNTING OF BLOOD

Following this discussion of vasomotor control of the peripheral blood flow it would appear that the treatment of functional vascular disorders is easy and rewarding. Yet all who have been called to treat patients afflicted with peripheral vascular diseases will agree that the effectiveness of vasodilator and sympatholytic drugs has been disappointing.

Vasodilator therapy suffers from one major disadvantage—dilatation affects all vessels throughout the body. If all vessels are normal, as they are in many vascular "disorders," there is no harm in this. If, however, there is vascular "disease" and various tissues (skin and muscle)

are competing with each other for a limited amount of available blood and the resistance in one area is higher than in the rest of the body, induced vasodilatation may affect the delicately balanced distribution of blood considerably and may lead to a movement of blood from the area with the higher into one with a lesser resistance. Obviously such changes are particularly prone to occur in the vascular diseases in which one limb is considerably more affected than the other.

The difference in peripheral resistance referred to need not be the result of structural changes, since differences in vasomotor tone have similar effects. For instance, body heating, which normally produces reflex vasodilatation, will in the sympathectomized limb be accompanied by a shunting away of blood from the sympathectomized limb (25). Therefore, reflex vasodilator therapy will be not only of doubtful value but also definitely contraindicated in those patients whose symptoms persist or recur after a technically successful sympathectomy.

Similarly, in the advanced case of organic arterial disease with ischemic neuritis and signs of sympathetic denervation, generalized vasodilator therapy may result in shunting away of the blood from the area where it is most needed.

A further objection to general vasodilator therapy is the drop in blood pressure. With some drugs this is perhaps more theoretical than real, but many vasodilators are in effect hypotensive drugs.

Again this consideration does not enter the picture when dealing with vasospastic vascular disorders, but is of importance in the advanced case of peripheral vascular disease in which the limb depends entirely on the collateral circulation. In the collateral vessels the blood pressure may be so precariously low that it is only just above the critical closing pressure. Any lowering of the blood pressure may disturb this delicate balance and produce a complete shut-down of the collateral circulation.

These are some of the considerations which have to be kept in mind when treating patients with occlusive arterial disease. Because of the central depressor and general dilator effects of vasodilators, blood may be shunted away from the diseased limb into areas which are less or not at all affected by the disease process. Consequently, vasodilator therapy may achieve exactly the contrary of what was intended.

We see then that the principle of lending and borrowing, which plays such an essential part in the control of the normal cardiovascular physiology, in the case of diseased peripheral circulation deteriorates into one of robbing Peter to pay Paul.

THE ROLE OF VENOMOTOR TONE

The interest of physiologists has been centered on the vasomotor control of the resistance vessels, i.e., arterioles and adjacent smaller arteries, and the role played by the capacity vessels (veins) in homeostasis has been neglected. Gauer and Henry have suggested extending this low pressure system to include the lungs. Thus, this part of the circulation accommodates 85 per cent of the total blood volume. It stands to reason that vasomotion in this bed must also have profound effects on homeostasis in the arterial bed.

We are still ignorant about many aspects regarding control of venous tone and have assumed that it runs parallel to arterial vasomotor control in most areas. That this is not necessarily so has recently been shown by Salzman. Using a miniature balloon technique, marked reflex constriction of the superficial peripheral veins was demonstrated following carotid occlusion, which could be eliminated by carotid sinus denervation.

There have been numerous studies which tried to establish that the veins of the extremities are the site of important sensory receptors.

According to Gaskell and Burton distention of the veins (by lowering the legs as little as 15 degrees) results in an increase in vascular resistance of the respective region, causing an over-all reduction of blood flow. Although this reaction can be abolished by procaine in the rabbit (49), sympathectomy does not affect it in the human limb. Burton, therefore, postulated that the response is mediated by the local nerve network and coined the term venivasomotor reflex. However, this explanation is by no means generally accepted and Greenfield suggested that in Burton's original experiment vasoconstriction arose not in the veins but in the arterioles themselves.

Other evidence marshalled to prove the existence of this venivasomotor reflex has been the so-called afterdrop seen in the plethysmogram following venous occlusions. This afterdrop we have held is not a nervous reflex, but a mechanical response of the venous wall to the stretch as produced during distention (25). If a vein, which

during rest has been partly filled, is being distended by venous occlusion, and if this distention is suddenly released, then the wall contracts. It does not restore the original lumen, but overshoots to varying degrees like the string of a bow. This causes a contraction of the venous bed below the original level as judged by a fall in volume below the baseline. The afterdrop is, therefore, the result of a temporarily increased venous outflow and there is no need to invoke the aid of a nervous reflex arising in the veins and acting on the arterial side. Hence, it is not abolished by sympathectomy (25). On the other hand, Allwood and Gaskell (18) have shown that the draining of blood from the peripheral veins into the veins collapsed by the collecting cuff could equally well explain the afterdrop.

The existence of a venivasomotor reflex would offer an attractive explanation for a number of phenomena, such as the higher vasomotor tone in the lower extremity as compared with the upper limb (25) and the peripheral congestion seen in congestive heart failure. In fact, some of the results of therapeutic measures aimed at interrupting such a reflex seem to bear out its existence. However, further evidence will have to be provided before the existence of the reflex will definitely be established.

The part contributed by the veins in determining skin temperature is not generally appreciated and skin temperatures are generally interpreted solely in terms of arterial vasomotor reactivity. Even slight elevation of a normal limb will greatly modify the response of the skin temperature to body heating. Instead of the 34 degrees centigrade recorded in the horizontal posture after 30 minutes of body heating, skin temperature may reach only 27 or 28 degrees centigrade (29). The significance of this in the interpretation of skin temperatures in the Landis Gibbon test is readily appreciated, and indeed many controversial results contained in the literature can be explained by an unawareness of this fact.

The failure of the skin temperature to reach the normal vasodilatation level in the elevated limb is not due to difficulties of overcoming vasoconstrictor tone or due to a decrease in arterial forward pressure. This has been demonstrated by simultaneous plethysmographic measurements (29).

The reverse occurs in the pendant limb where the slightest release of arterial tone results in a rapid rise in the skin temperature (29). On body heating the skin temperature reaches the normal vasodilatation level even before full vasodilatation of the vessels occurs. We, therefore, are confronted with a situation in which, on body heating, the skin temperature will not reach the vasodilatation level within 30 minutes in a normal but elevated limb, whereas the vasodilatation level will be easily reached in a pendant limb with relatively advanced arterial disease. It is clear, therefore, that in any study of the vasoconstrictor reactivity of the peripheral circulation the posture of the patient during the study has to be carefully noted and incorporated in the interpretation of the results.

CIRCULATORY ECONOMY AND VASA PRIVATA VERSUS VASA PUBLICA

Whereas we take it for granted that organs like the liver and the lungs should be supplied by two sets of vessels—one for their "private" nutritional use, the other serving the general or "public" functions of the organ, the existence of a similar division in blood flow in organs supplied with one vessel only is becoming more and more apparent. In the skin this role of partitioning the blood flow falls upon the arteriovenous anastomoses which thus play a vital part in the vasomotor activity affecting the skin. This functional division of the cutaneous blood flow into nutritive capillary blood flow and flow through arteriovenous anastomoses serving body temperature control provides an example of the wider application of this principle concerning vasa privata versus vasa publica. Serving body temperature control, the cutaneous arteriovenous anastomoses are controlled by the hypothalamic heat loss center and, therefore, are richly supplied by constrictor fibers. When acutely denervated they are, therefore, widely dilated (8, 14). Evidence that they may, in addition, be reflexly constricted from baroreceptor areas has been presented by Bostroem and Schneider. The existence of arteriovenous anastomoses has been demonstrated in many other organs but the evidence of such shunts in skeletal muscle is not convincing. The existence of preferential arteriolar pathways in some organs, such as in the villi of the intestine, can be considered under the same heading of circulatory economy.

The profound vasomotor changes brought about by the arteriovenous anastomoses is perhaps best illustrated by the clinical picture ex-

hibited in the case of a small tumor arising from one of them (36).

VASOMOTOR ACTIVITY AND SYMPATHECTOMY IN FUNCTIONAL VASCULAR DISORDERS

It would appear then that the physiologist is acquiring a good grasp of the integrating aspects of the control of the peripheral blood flow. However, the rate with which this knowledge has been applied to clinical problems has been slow and our understanding of the pathophysiology of the so-called functional vascular disorders has not been advanced to the same extent. For instance, the exact derangement of the vessels in such common conditions as acrocyanosis or Raynaud's phenomenon is still being debated and one of our greatest problems in the treatment of these diseases is still the selection of those patients who will benefit from sympathectomy.

Whereas sympathetic denervation of the lower extremities has never presented any problem, sympathectomy for the upper limbs, despite numerous modifications of the original procedure, has not given the ideal results so easily achieved in the lower (27). This fact was recognized soon after the procedure had been introduced and inspired a great deal of speculation and original work. Both hypersensitivity of the vessels to adrenaline and regeneration of the fibers have been the subject of investigation to determine the cause for the failures. It is now generally agreed that the differences in sensitization of the effector organs to adrenaline following different types of sympathectomy (ganglionectomy versus preganglionic ramisection), although valid in the animal, are of no clinical importance in man. If we compare the reaction of adrenaline infusion or of insulin hypoglycemia in the two types of operation, we see that the response is the same irrespective of whether the operation was preganglionic or postganglionic in type (28).

If the preganglionic ramisection, nevertheless, has remained in favor instead of the cervicodorsal ganglionectomy, it has done so because it does not produce a Horner's syndrome, and not for its supposed merits in producing permanent sympathetic paralysis (28).

Regeneration has been blamed for the bad results in all types of sympathectomy, i.e., ganglionectomy and preganglionic ramisection. Although valid in our opinion for the latter it could hardly apply for ganglionectomy since the preganglionic fibers are cholinergic and on regeneration are unable to link up with adrenergic effector organs once the ganglia have been removed (28).

There are other grave objections to leaving ganglion cells and their postganglionic connections intact and decentralizing the limb by severing preganglionic connections only. One has been referred to as reorganization (23, 28). In the case of the preganglionic cervicodorsal sympathectomy it was thought that reorganization of sympathetic outflow to the arm was accomplished by intact fibers which were synapting with ganglion cells in the superior cervical ganglion, normally innervating the skin of the face and the pupillary apparatus. These fibers were thought to establish connections with the ganglion cells supplying the arm when the latter were decentralized by interruption of the preganglionic fibers.

The more recent studies of Monro and of Murray and Thompson fully support this view and point more specifically to "sprouting" as the responsible mechanism. It is impossible here to go into any detail about sprouting. Suffice it to say that sprouting is a response to trauma or operation by the intact nerve fibers to the presence of adjacent degenerated fibers brought about by the release of a humoral agent of the degenerating fibers. Whatever the stimulus to sprouting, it is most vigorous where the intermingling of degenerated and intact fibers is the greatest. By leaving the ganglion cells behind and interrupting preganglionic fibers we create, therefore, the most favorable conditions for sprouting to take place and give the sprouts a good chance of reaching a suitable end organ and developing a successful functional union.

This work, therefore, fully supports our earlier experiences that "lasting and complete sympathectomy (of the arm) can best be achieved by performing (cervicodorsal) ganglionectomy . . . and if possible, include the middle cervical and third dorsal ganglia as well in order to be certain that there remain no undivided preganglionic fibers and postganglionic synapses as in the old stellatectomy" (28). By carrying out such an extensive ganglionectomy we remove the target area for the sprouts to establish functional connections.

We are well aware that the failure of sympathectomy has been ascribed to the presence of

the so-called intermediate ganglia, microscopic masses of ganglion cells distributed without any definite rule in the communicating rami to the paravertebral ganglia (9, 27, 54). They send postganglionic fibers to the nearby spinal nerve which may escape during standard sympathetic denervation.

Skoog visualizes two possible pathways by which the intermediate ganglia receive their preganglionic supply: (1) via the sympathetic trunk and (2) directly from the spinal nerve next to which they are lying. If the former is true then the significance of the intermediate ganglia is less important from the surgical point of view, since removal of the chain will automatically denervate them. However, if the latter is applicable, then we are dealing with entirely intraspinal sympathetic pathways, not accessible to the surgeon by the standard methods employed in interrupting the sympathetic supply. Therefore, the intraspinal sympathetic pathways could easily explain failures following removal of the ganglia in order to sympathectomize the upper extremities. In the lower limb intermediate ganglia are of less importance as the preganglionic connections of such ganglia, if they are situated in the roots of the sciatic nerve, will have to pass through the second and third lumbar ganglia which are normally removed. So far no sympathetic spinal outflow has been demonstrated below the second or third lumbar level and, therefore, it has to be assumed that the intermediate ganglia below that level receive their preganglionic supply via the sympathetic trunk as do the conventional ganglia.

Sweating tests on a large number of patients following the extended sympathectomy (removal of the stellate, middle cervical, and the second dorsal ganglion) for the hands and the standard operation for the legs have not revealed any sudomotor escape areas. This is evidence that in the denervation of the extremities the intermediate ganglia are not of the importance made out by some and that completeness of the surgical procedure to avoid reorganization by sprouting is the main, if not the only, determining factor for successful denervation.

If despite this, the extended cervicodorsal sympathectomy has in some instances given poor results, it has been for one important point which has escaped attention. In the lower limbs sympathectomy is more commonly performed to release normal vasomotor tone in cases of obstructive arterial disease, whereas in the upper extremities cases with entirely different pathologic changes, i.e., Raynaud's disease, constitute the vast majority. This difference is of importance on account of the local changes that occur in Raynaud's disease. The results of sympathectomy in upper and lower extremities can, therefore, only be compared if the operation was carried out for the same pathological condition. If the extended cervicodorsal sympathectomy is performed for other than Raynaud's disease, e.g. to release vasomotor tone in a case of organic arterial disease, then the results compare favorably with those observed in lumbar sympathectomy carried out for the same condition.

RETURN OF VASCULAR TONE

Having completely sympathectomized a limb we have to contend with a return of vascular (not vasomotor) tone. Here again we come up against the same problem, namely, that on studying this phenomenon a distinction must be made between the patients sympathectomized for completely different pathologic conditions. A great deal of confusion and many of the misconceptions can be attributed to the failure to recognize this concept. Conclusions drawn from following the return of vascular tone in a case of Raynaud's disease are valid for Raynaud's disease only and do not necessarily apply to the normal.

We cannot enter into the existing controversies on this subject but would like to enumerate the existing viewpoints concerning its cause: (1) increased sensitivity of the vessel wall to circulating adrenaline; (2) elimination of normal synthesis of acetylcholine in the arterial wall which keeps the normal artery in a state of dilatation and is abolished as the sympathetic fibers degenerate (2); and (3) disappearance of amine oxydase content of the arterial wall (55).

None of these theories has served to explain all the known facts about the return of vascular tone. It seems that the smooth muscle cell has an inherent basal tone, predominantly dependent on local factors. This myogenic automaticity is generally accepted for the heart and visceral smooth muscle cells.. However, it would appear that "the evidence for an automaticity of vascular smooth muscle cells is in fact just as good though big quantitative differences probably exist in different parts of the vascular tree" (16).

REFERENCES

1. ALLWOOD, M. J. The "after-drop" in venous occlusion plethysmograms. Circulation Res. 1956, 4: 268.
2. ARMIN, J., GRANT, R. T., THOMPSON, R. H. S., and TICKNER, A. An explanation for the heightened vascular reactivity of the denervated rabbit's ear. J. Physiol., Lond., 1953, 121: 603.
3. ARNOTT, W. M., and MACFIE, J. M. A study of the effect of ulnar nerve block on the blood flow in the reflexly vasodilated digit. J. Physiol., Lond., 1948, 107: 233.
4. BARCROFT, H., BOCK, K. D., HENSEL, H., and KITCHIN, A. H. Die Muskeldurchblutung des Menschen bei indirekter Erwärmung und Abkühlung. Pflügers Arch., 1955, 261: 199.
5. BARCROFT, H., BONNAR, W., EDHOLM, O. G., and EFFRON, A. S. On sympathetic vasoconstrictor tone in human skeletal muscle. J. Physiol., Lond., 1943, 102: 21.
6. BARCROFT, H., EDHOLM, O. G., MCMICHAEL, J., and SHARPEY-SCHAFER, E. P. Posthemorrhagic fainting. Lancet, Lond., 1944, 1: 489.
7. BOSTROEM, B., and SCHNEIDER, P. W. Uber die Wirkung depressorischer Reflexe auf die Durchblutung der arterio-venösen Anastomosen der Hundeextremität. Pflügers Arch., 1953, 257: 24.
8. BOSTROEM, B., and SCHOEDEL, W. Uber die Durchblutung der arterio-venösen Anastomosen in der hinteren Extremität des Hundes. Pflügers Arch., 1953, 256: 371.
9. BOYD, J. D., and MONRO, P. A. G. Partial retention of autonomic function after paravertebral sympathectomy. Lancet, Lond., 1949, 2: 892.
10. BÜLBRING, E., and BURN, J. H. The sympathetic vasodilator fibers in the muscles of the cat and dog. J. Physiol., Lond., 1935, 83: 483.
11. BURCH, G. E. Digital rheoplethysmography. Circulation, 1956, 13: 641.
12. BURTON, A. C. On the physical equilibrium of small blood vessels. Am. J. Physiol, 1951, 164: 319.
13. Idem. Relation of structure to function of the tissues of the wall of blood vessels. Physiol. Rev., 1954, 34: 619.
14. CELANDER, O., and FOLKOW, B. A comparison of the sympathetic vasomotor fiber control of the vessels within the skin and the muscles. Acta physiol. scand., 1953, 29: 241.
15. EDHOLM, O. G., FOX, R. H., and MACPHERSON, R. K. The effect of body heating on the circulation in skin and muscle. J. Physiol., Lond., 1956, 134: 612.
16. FOLKOW, BJORN. Nervous control of the blood vessels. Physiol. Rev., 1955, 35: 625.
17. FOX, R. H., and HILTON, S. M. Bradykinin formation in human skin as a factor in heat vasodilatation. J. Physiol., Lond., 1958, 142: 219.
18. GASKELL, P. The significance of the "after-drop" in venous occlusion plethysmography. J. Physiol., Lond., 1956, 131: 627.
19. Idem. Are there sympathetic vasodilator nerves to the vessels of the hands. J. Physiol., Lond., 1956, 131: 647.
20. GASKELL, P., and BURTON, A. C. Local postural vasomotor reflexes arising from the limb veins. Circulation Res., 1953, 1: 27.
21. GASKELL, P., and KRISMAN, ASHLEY, M. Report on the critical closing pressure of vessels supplying the capillary loops of the nailfold. Circulation Res., 1958, 6: 461.
22. GAUER, OTTO H., and HENRY, JAMES P. Beitrag zur Homeostase des Extraarteriellen Kreislaufs. Klin. Wschr., 1956, 34: 356.
23. GEOHEGAN, W. A., and AIDAR, O. J. Functional reorganization following preganglionectomy. Proc. Soc. Exp. Biol., N. Y., 1942, 50: 928.
24. GOETZ, R. H. Der Fingerplethysmograph als Mittel zur Untersuchung der Regulationsmechanismen in Peripheren Gefässgebieten. Pflügers Arch., 1935, 235: 271.
25. Idem. The rate and control of the blood flow through the skin of the lower extremities. Am. Heart J., 1946, 31: 146.
26. Idem. A photoelectric drop recorder for investigating cardiovascular effects of drugs in man. Lancet, Lond., 1948, 1: 830.
27. Idem. The surgical physiology of the sympathetic nervous system with special reference to cardiovascular disorders. Surg. Gyn. Obst., 1948, 87: 417.
28. Idem. The diagnosis and treatment of vascular diseases with special consideration of clinical plethysmography and the surgical physiology of the autonomic nervous system. Brit. J. Surg., 1949, 37: 25, 146.
29. Idem. Effect of changes in posture on peripheral circulation, with special reference to skin temperature readings and the plethysmogram. Circulation, 1950, 1: 56.
30. Idem. Preliminary observations on the circulation in the giraffe. Tr. Am. Coll. Cardiol., 1955, 5: 239.
31. GOETZ, R. H., DU TOIT, J. G., and SWART, B. H. Vascular changes in poliomyelitis and the effect of sympathectomy on bone growth. Acta med. scand., 1955, 152: 56.
32. GOETZ, R. H., and KEEN, E. N. Some aspects of the cardiovascular system in the giraffe. Angiology, 1957, 8: 542.
33. GOLENHOFEN, K., and HILDEBRANDT, G. Spontaneous rhythmic fluctuations of blood circulation in human muscles. Zschr. Krebsforsch, 1957, 46: 257.
34. GRANT, R. T., and HOLLING, H. E. Further observations on vascular responses of human limb to body warming; evidence for sympathetic vasodilator nerves in normal subject. Clin. Sc., Lond., 1938, 3: 273.
35. GREENFIELD, A. D. M., and PATTERSON, G. C. The effect of small degrees of venous distension on the apparent rate of blood inflow to the forearm. J. Physiol., Lond., 1954, 125: 525.
36. KATZ H., and GOETZ, R. H. Glomus tumors. South Afr. M. J., 1949, 23: 290.
37. LEWIS, T. and PICKERING, G. W. Vasodilatation in the limbs in response to warming the body; with evidence for sympathetic vasodilator nerves in man. Heart, Lond., 1931, 16: 33.
38. MCDONALD, D. A. A relation of pulsatile pressure to flow in arteries. J. Physiol., Lond., 1955, 127: 533.
39. MCGIRR, E. M. The rate of removal of radioactive sodium following its injection into muscle and skin. Clin. Sc., 1952, 11: 91.
40. MONRO, P. A. G. Anterior rhizotomy of preganglionic fibers in man. J. Anat., Lond., 1954, 88: 567.
41. MURRAY, J. G., and THOMPSON, J. W. Collateral sprouting in response to injury of the autonomic nervous system and its consequences. Brit. M. Bull., 1957, 13: 213.
42. RODDIE, I. C., and SHEPHERD, J. T. The effects of carotid artery compression in man with special reference to changes in vascular resistance in the limbs. J. Physiol., Lond., 1957, 139: 377.
43. RODDIE, I. C., SHEPHERD, J. T., and WHELAN, R. F. The reflex nervous control of human skeletal muscle blood vessels. Clin. Sc., 1956, 15: 433.
44. Idem. Evidence from venous oxygen saturation measurements that the increase in forearm blood flow during body heating is confined to the skin. J. Physiol., Lond., 1956, 134: 444.

45. Idem. Vasomotor nerve supply to skin and muscle of the human forearm. Clin. Sc., 1957, 16: 67.
46. Idem. A comparison of the heat elimination from the normal and nerve-blocked finger during body heating. J. Physiol., Lond., 1957, 138: 445.
47. Idem. The contribution of constrictor and dilator nerves to the skin vasodilatation during body heating. J. Physiol., Lond., 1957, 136: 489.
48. Idem. Reflex changes in human skeletal muscle blood flow associated with intrathoracic pressure changes. Circulation Res., 1958, 6: 232.
49. Rosenberg, E. Local character of the venivasomotor reflex. Am. J. Physiol., 1956, 185: 471.
50. Salzman, E. W. Reflex peripheral venoconstriction induced by carotid occlusion. Circulation Res., 1957, 5: 149.
51. Sarnoff, S. J., and Simeone, F. A. Vasodilator fibers in human skin. J. Clin. Invest., 1947, 26: 453.
52. Schiele-Wiegandt, V. Uber Wanddicke und Umfang der Arterien des Menschlichen Koerpers. Virchow's Arch. 1880, 82: 27.
53. Schönbach, G., and Langendorf, H. Das Verhältnis von Innenradius und Wandstärke in den Kleinen Blutgefässen. Akademie der Wissenschaften und der Literatur. Abh. Math.—Naturwiss. Kl., 1955, 6: 1.
54. Skoog, T. Ganglia in the communicating rami of the cervical sympathetic trunk. Lancet, Lond., 1947, 2: 457.
55. Thompson, R. H. S., and Tickner, A. The occurrence and distribution of monoamine oxidase in blood vessels. J. Physiol., Lond., 1951, 115: 34.
56. Uvnas, B. Sympathetic vasodilator nerves. Physiol. Rev., 1954, 34: 608.
57. Wezler, Karl, and Sinn, Werner. Das Strömungsgesetz des Blutkreislaufes Arzneimittel-Forschung, 3. Beiheft. Edition Cantor KG., Aulendorf i. Württ, 1953.
58. Winsor, Travis. Conditioned vasoconstrictive responses of digital vessels. Arch. Surg., 1958, 76: 193.
59. Womersley, J. R. Method for the calculation of velocity, rate of flow and viscous drag in arteries when the pressure gradient is known. J. Physiol., Lond., 1955, 127: 553.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Vascular Surgery in Operations on the Head and Neck. JOHN M. LORE, JR. *Ann. Otol. Rhinol.*, 1958, 67: 922.

VASCULAR SURGERY has become a vital part of the armamentarium of surgeons who perform operative procedures on the structures of the head and neck. The author describes techniques of management of vascular injuries, aneurysms, and arteriovenous fistulas, vessel involvement by tumors, and vascular occlusive disease, all in relation to the head and neck region. Emphasis is placed on tracheostomy as an adjunct to the control of hemorrhage arising postoperatively or after trauma. Digital compression, packing, and finally repair or grafting are pointed out as the essentials of treatment in common carotid bleeding. General supportive care and meticulous arterial surgery are shown to be important in lowering the mortality from such vascular injuries and the methods of restoration of continuity of the common and internal carotid blood flow are outlined. Ways of preventing constriction of the arteriorrhaphy site are described and the replacement of vessel defects with autogenous vein grafts (preferred by the author), homologous arterial segments, and synthetic materials is enlarged upon.

The author describes the excellent results obtained in 3 of 5 dogs undergoing abdominal aortic replacement with autogenous peritoneal tubes in an experimental search made to discover new and improved techniques of grafting.

Aneurysms of the common and internal carotid arteries and of the subclavian artery are managed by excision and grafting or end-to-end restoration while such disease in other vessels of the neck is managed by proximal-distal ligation. Arteriovenous fistulas are described and dissection, division of the tract, and lateral repair of the vessels or vein-artery excision plus grafting are fully outlined in the management of this condition.

A discussion is included of vascular resection and grafting in radical neck surgery for cancer and of the techniques used in the removal of tumors of the carotid body.

Carotid occlusive disease of the neck is briefly mentioned and its importance in cerebrovascular accidents pointed out. Endarterectomy, excision and replacement, and bypass grafting are listed as the choices in therapy. —*William Nelson, M.D.*

EYE

Ataractic and Antiemetic Drugs. R. D. HARLEY and J. E. MISHLER. *Am. J. Ophth.*, 1959, 47: 177.

THE RELATIVE EFFECTIVENESS of chlorpromazine (thorazine), prochlorperazine (compazine), and perphenazine (trilafon) as ataractic and antiemetic agents in 250 consecutive cataract extractions is reported. These drugs are all phenothiazine derivatives.

Chlorpromazine produces sleep, potentiates the action of other analgesics and anesthetic drugs, depresses the vomiting centers, and reduces muscle tone. On the basis of weight, prochlorperazine is approximately three to four times more effective than chlorpromazine, and perphenazine is between five and ten times more potent than chlorpromazine.

According to the authors, prochlorperazine and perphenazine are effective ataractic drugs, but chlorpromazine is a more potent ataractic than the other two. All of the drugs are effective adjuvants in cataract surgery. Because of the potentiating action of chlorpromazine, care must be exercised when using the drug with narcotics and sedatives in older patients.

Complications and side effects which may occur with the use of these drugs include vascular accidents in aging patients (precipitated, perhaps, by slowing of the blood stream) "chlorpromazine pallor" (which resembles shock), jaundice, agranulocytosis, dermatologic reactions, and extrapyramidal effects ranging from a motor restlessness to a Parkinson-like syndrome. There were four serious complications in the authors' series, which may not have been related to the medication. One patient developed an atelectasis, another had a coronary infarction, one developed a pulmonary infarct, and one had a cerebrovascular accident. —*J. J. Stokes, M.D.*

Paralysis of the Third, Fourth, and Sixth Cranial Nerves. C. WILBUR RUCKER. *Am. J. Ophth.*, 1958, 46: 787.

THE AUTHOR reports on 409 cases of paralysis of the sixth cranial nerve and lists the causes as follows: head trauma in 57 cases; neoplasm in 82 cases; vascular disease in 57 cases; aneurysm in 16 cases, and unknown in 129 cases. The miscellaneous group of 68 cases included meningitis, encephalitis, mastoiditis, poliomyelitis, syphilis, and multiple sclerosis. Paralysis of the third and fourth cranial nerves combined and of the

third and sixth cranial nerves combined had no single denominating cause. Vascular disorders were rare in the multiple nerve paralyses.

Paralysis of the third, fourth, and sixth cranial nerves combined showed the disease process to be widespread and the damage extensive.

Tables for all the paralyses made up the summary of the article. —*Earl H. Merz, M.D.*

Traumatic Hyphema. MILTON J. LORING. *Am. J. Ophth.*, 1958, 46: 873.

THE AUTHOR reports on 56 cases of hyphema. He lists the various causative agents, the ages of the patients involved, and the complications which occurred.

He arrived at the following summary after his study.

1. Children under age 15 account for 65 per cent of the cases of traumatic hyphema.

2. The most common complication encountered is secondary hemorrhage on the third or fourth day, associated with glaucoma.

3. The secondary hemorrhage and glaucoma in children are much more severe than in adults and the resulting loss of vision is much greater.

The only treatment is bed rest, nonuse of the eyes, and sedation. Cycloplegics were used only sparingly and atropine was avoided. Miotics were not used. In secondary glaucoma diamox proved to be of marked value, especially in the first 4 or 5 days.

—*Earl H. Merz, M.D.*

Orbital Fractures. W. L. ERDBRINK, J. E. EDWARDS, W. W. CROWE, H. S. JOHNSON, and Others. *Arch. Ophth.*, Chic., 1959, 61: 55.

FRACTURES ABOUT THE ORBIT frequently involve the orbital structures themselves and an ophthalmologist is frequently first to be called. Trauma about the eyes is common and its diagnosis and treatment is discussed in this article.

The symptoms and findings are (1) "black-eye," (2) swelling, (3) numbness, (4) diplopia, (5) nose bleeds, (6) headaches, (7) asymmetry of the face, (8) tenderness to touch, (9) air in the tissues, and (10) loss of vision.

A roentgenogram is essential for proper diagnosis and treatment. The Waters nose-chin position is good for roentgenography of the floor of the orbit, zygoma, and the arches, as well as for the antra, while the Caldwell nose-forehead position is better for the orbital margins and for the frontal and ethmoid sinuses as well.

The treatment aims at (1) replacing bony parts, (2) maintenance of vision and ocular motility with elimination of diplopia, and (3) minimum facial scarring and cosmetically acceptable repair.

Many excellent pictures were used to illustrate the article. —*Earl H. Merz, M.D.*

Controlled Correction of Diplopia and Eye Muscle Imbalance in Orbital and Zygomatic Fractures. RUDOLPH H. PELZER and WILLIAM J. GARVIN. *Am. J. Surg.*, 1958, 96: 735.

THE INCIDENCE of facial trauma is increasing because of the growing number of automobile accidents. Ocular findings, such as diplopia and enophthalmos, are frequent complications of fractures of the facial bones. This is especially true in the common zygomatic fractures, and in the rarer fractures of the floor of the orbit without damage to the zygoma or the orbital margin.

The diplopia is almost always vertical with involvement of the inferior oblique or the inferior rectus muscles. Enophthalmos occurs when the contents of the orbit retract abnormally and herniate into the maxillary sinus.

The authors recommend surgical reduction of the fractures under local anesthesia. The ocular defects should be controlled during operation with the aid of screen cover testing for management of the diplopia and the exophthalmometer for checking the degree of exophthalmos.

Four cases are reported.

—*J. Winston Duggan, M.D.*

Scleral Imbrication for Retinal Detachment. KENNETH C. SWAN. *Arch. Ophth.*, Chic., 1959, 61: 110.

THE PURPOSE of the author is to describe an improved type of scleroplasty. This operation is used for the treatment of retinal detachments which ordinarily do not respond to conventional transscleral diathermy. The operation has been called a scleral imbrication because the outer layers of the sclera are undermined and then overlapped in one or more quadrants of the globe.

The sclera is exposed by an incision through the conjunctiva and Tenon's capsule and in the region of the equator. It is made perpendicular to the surface and extends approximately three-quarters of the way through the sclera; preferably the incision is not made over the site of any of the muscles but between them. A thin knife is used to dissect posteriorly and undermine the area of the sclera. After the deeper layers of the sclera have been exposed a muscle hook can be placed to determine where the incision has been made in reference to the hole. If the hole is further posteriorly more dissection can take place; if it has extended as far posteriorly as the hole, then closure is carried out.

Nonpenetrating diathermy is applied to focal areas throughout the surrounding area so that the entire area around the incision has been treated. A penetrating diathermy puncture is then placed through the exposed deeper layers of the sclera and the choroid to allow the fluid to escape. Mattress sutures are then placed from the proximal side of the sclera and extending under the scleral flap as far posteriorly as desired and then after the sutures are closed the posterior lip of the sclera is pulled over the anterior sclera for 2, 3, or 4 mm., as desired.

This is all done with No. 0000 or No. 00000 absorbable surgical (gut) sutures. The advantage of this type of sclera imbrication or overlapping is that the exposure permits accurate localization of the retinal tears before any diathermy is applied. A permanent flattening of the curvature of the globe results in a definite reduction in its volume. The sclera is reinforced and more rigid in the region of the tear instead of being weaker.

More than 100 patients with various types of retinal detachments have been treated with success in 80 per cent. —*Earl H. Merz, M.D.*

The Scleral Buckling Procedures. R. J. BROCKHURST, C. L. SCHEPENS, and I. D. OKAMURA. *Arch. Ophth.*, Chic., 1958, 60: 1003.

THE AUTHORS are strong advocates of scleral buckling procedures as the surgery of choice for retinal detachment. This article deals with the technical difficulties that arise when scleral buckling is used as a secondary procedure following unsuccessful retinal surgery. The difficulties are related to conjunctival adhesions to the sclera, the exposure of the surgical field, the friability of a sclera that has been traumatized by diathermy coagulation, the identification of the vortex veins, and the insertion of sutures in a quite possibly weakened sclera.

The conjunctiva should be carefully dissected and all granulations removed. Proper exposure should be secured by dissection under direct observation and severing of recti muscles wherever necessary; the danger of blind dissection and pulling with a muscle hook is perforation of the sclera. Diathermy coagulation should be done intermittently with a weak current and fine needles inserted obliquely; an excessive rise of intraocular tension should be avoided. The area of drainage of the intraocular fluid should be carefully selected ophthalmoscopically, to avoid perforation of the retina. The vortex veins should also be carefully avoided. Special difficulties arise from excessive diathermy coagulation at the previous operation and from multiple scleral perforations. Large scleral perforations also cause special problems. The technique of dealing with these complications is described and illustrated in detail. —*Ray K. Daily, M.D.*

EAR

The Treatment of Meniere's Disease with Ultrasonic Waves. FRANZ ALTMANN and JULES G. WALTNER. *Arch. Otolar.*, Chir., 1959, 69: 7.

THE DEVELOPMENT of the treatment of Meniere's disease with ultrasound is described and details of the Arslan technique are given. Arslan exposes the lateral semicircular canal via a postauricular approach limited in extent to avoid disturbing the incus; thorough hemostasis is essential. The tip of the ultrasound transducer is applied to the convexity of the exposed canal and the treatment begun (at about 7 to 8 watts/sq. cm.), while an assistant watches for signs of irritative nystagmus (fast component to the treated side) and facial nerve stimulation. Irritative nystagmus usually starts 2 or 3 minutes after the commencement of treatment and is replaced several minutes later by paralytic nystagmus (reversal of the quick component). The treatment is continued until paralytic nystagmus is present, no matter what the orientation of the ultrasound probe.

In none of the authors' 6 patients was the hearing decreased after the treatment and in 4 of them the tinnitus was considerably reduced. Two of the patients had persistent vestibular symptoms after treatment, which indicated that the destruction had not been sufficiently extensive. The authors conclude that their results are encouraging and that the use of ultrasound may replace present surgical methods for destroying the labyrinth.

—*John R. Lindsay, M.D.*

Stapes Mobilization. EDWARD H. CAMPBELL. *Arch. Otolar.*, Chic., 1958, 68: 663.

AN ANALYSIS of the results obtained in 250 stapes mobilization operations is presented.

The technique employed, in the great majority of the cases, has been a pulsating pressure applied alternately to various parts of the stapes footplate and to the incus and stapes head.

The results have been judged largely on the basis of improvement of hearing to the 30 db. level or better and the improvement to or near the level predicted on the basis of the preoperative bone conduction.

In 11, or 4.4 per cent of the cases, the improvement of hearing reached almost to the normal line (an average of less than 7 db. loss to the speech frequencies).

In 120 additional patients, or 48 per cent of the 250 cases, the hearing was improved to the 30 db. level or better. A practical, serviceable hearing level was, therefore, obtained in 52.4 per cent of the cases.

Fifteen patients, or 6 per cent, received an improvement of 15 db. or more, and in 7 of these the hearing was improved to the preoperative prediction level.

In 8.4 per cent of the cases the hearing was made worse by the operation. Most of these were worse by less than 10 db. The factors concerned in the loss were fractures of the crura and dislocation at the incudostapedial joint in nearly all the cases.

A mobilization revision was performed on 12 of the patients; 4 of the revisions were entirely successful and 3 additional ones were partially successful.

The analysis indicated that mobilization could be accomplished in as high a percentage in the "B" and "C" suitability groups as in the "A" or ideally suitable patients. It was further observed that mobilization was as successful in the patients over 55 years of age as it was in the group 20 to 30 years of age.

Mobilization was unsuccessful for the following reasons: incomplete or partial loosening of the footplate, fractures of one or both crura, dislocation at the incudostapedial joint, advanced diffuse otosclerosis, anomalies of the conduction mechanism, and adhesive formations in the middle ear.

The fenestration operation was performed on 43 of the 112 mobilization failures. Of these 79 per cent have been entirely successful and an additional 12 per cent have been partially successful.

The complications have been of a minor nature and consisted of prolonged dizziness or sense of unbalance, occasional perforations of the tympanic membrane, and secondary middle-ear infections in 2 cases.

—*John J. Ballenger, M.D.*

Cochleovestibular Lesions in Cranial Traumas (Le lesioni cocleo-vestibolari nei traumatizzati cranici). P. PUGLISI and G. PERIA. *Ann. ital. chir.*, 1958, 35: 471.

TRANSITORY or permanent lesions of the cochleovestibular apparatus are observed relatively frequently after cranial injuries. The trauma may affect the middle or inner ear, the nuclei, or the vestibulocochlear apparatus itself. According to several workers, such complications are observed more frequently after injuries of the lateral portion of the skull than after direct injury to the frontal or occipital region. The type of fracture of the petrous bone (longitudinal,

transverse, oblique, or associated with other fractures) determines the site of the lesion of the auditory apparatus.

The lesions under discussion may be subdivided into two groups: (1) cochlear or labyrinthine concussion, either without anatomic lesions or with organic changes, such as perivascular infiltrative and hyperemic processes, rupture of the tympanum, or laceration of the region of the fenestra rotunda, and (2) lesions of the labyrinthine capsule, such as rupture of the tympanic ring or membrane, fracture of the auditory canal, or laceration of the secondary tympanum.

The diagnosis is based on the history and the results of otoscopic and audiometric examinations, caloric and rotatory tests, plus complete neurologic and roentgenologic studies. Symptoms of central origin are dominated by vestibular disturbance. The hearing is slightly or not at all impaired. Fractures of the labyrinthine capsule are usually accompanied by otorrhea, tumefaction of the skin, ecchymoses, and pain on mastication. Lesions of the cranial nerves may complicate the clinical picture.

Of a group of 25 patients with cochleovestibular lesions, in 11 the condition was accompanied by skull fracture. The sequels of the lesions were irreversible in patients with loss of consciousness in a greater percentage of cases than in those without such loss.

—*Joseph K. Narat, M.D.*

NOSE AND SINUSES

Cerebral Mucormycosis. HOWARD W. SMITH and JOHN A. KIRCHNER. *Arch. Otolar.*, Chic., 1958, 68: 715.

CEREBRAL MUCORMYCOSIS, a rapidly fatal fungus disease, has occurred with increasing frequency during the past 10 years. It is caused by a fungus of the Mucorales order which belongs to the class with nonseptate mycelia (Phycomycetes). The causative organism becomes invasive and nearly always lethal in patients who are being treated with chemical agents such as corticosteroids, antileukemic preparations, and especially antibiotics, when given to an uncontrolled diabetic.

The hyphae of the fungus show striking affinity for arteries, penetrating their walls and growing into their lumens to produce thrombosis. The lymphatics, veins, and nerves are invaded later. The disease frequently begins in the nose and spreads quickly to the sinuses or orbits on the way to the brain.

The authors emphasize the predisposing tendency to this disease exercised by uncontrolled diabetes. They include the following signs and symptoms as probably pathognomonic when they develop in an uncontrolled diabetic: the presence, on the same side as facial pain, of blood-tinged nasal discharge of brief duration, usually very dark in color; the appearance of soft periorbital or perinasal swelling which progresses to induration and discoloration (with progressive vascular occlusion). Ptosis of the lid and proptosis of the globe may occur with dilatation and fixation of the pupil and limitation of global mobility. Lethargy is progressive, in spite of good chemical response to diabetic therapy. Black necrotic nasal turbinates, easily mistaken for dried blood may be seen. Loss of the corneal reflex and the onset of facial weakness usually are seen late in the course of invasion.

Three case reports are given.

—*John J. Ballenger, M.D.*

MOUTH

Effect of Supplemental Vitamin Therapy on the Limitation of Incidence of Cleft Lip and Cleft Palate in Humans. HERBERT CONWAY. *Plastic & Reconstr. Surg.*, 1958, 22: 450.

THE BIOSTATISTICAL DATA of Bogh-Anderson are reported and the incidence of cleft lip and/or palate is given as 1:665 births. Projection of the data into the statement that if both parents are normal the chance of a similar deformity in a subsequent sibling is 5 per cent, and if either parent has a harelip plus cleft palate the chance of a subsequent sibling having such a deformity is 15 per cent, forms the criterion against which the author gauges his results.

To mothers who had previously given birth to children with a harelip, a multivitamin capsule was given daily by mouth and 1 c.c. of vitamin complex was given intramuscularly every other day for the first trimester. Of 87 mothers in his series, 48 did not receive vitamin therapy. There were 78 pregnancies in this group and 5 of the offspring had congenital anomalies (6.4 per cent). Of 39 mothers who received vitamin therapy, 59 children were born in subsequent pregnancies. None of these children had a cleft lip and/or cleft palate. —*Irwin D. Horwitz, M.D.*

Congenital Micrognathia. CHESTER M. WESEMAN. *Arch. Otolar.*, Chic., 1959, 69: 31.

IN AN EXTENSIVE REVIEW of the literature on the subject of congenital micrognathia the author discusses the normal embryologic development of the mandible from the first branchial arch, emphasizing that during the fourth or fifth month of fetal life micrognathia is physiologic but that this state of affairs is normally corrected between the sixth and ninth month by a more rapid rate of growth of the mandible. Congenital micrognathia (or Pierre Robins' syndrome) is the result of failure of this normal growth process, which results in glossoptosis and hypopharyngeal obstruction with concomitant breathing and feeding problems. Sixty-eight per cent of the cases reviewed in this study were complicated by cleft palate.

The most reasonable explanation of the condition is fetal malnutrition, but the author comments upon the rarity of micrognathia in Negroes. If postnatal complications can be avoided, and if nutritional defects are corrected, the condition will largely right itself although a relative deformity always remains. The author describes the Beverly Douglas operation for suturing the tongue to the lower lip and advocates the use of this procedure, positioning, and tracheotomy as therapeutic measures, singly or in combination, depending upon the severity of the symptoms. It is emphasized that the common reluctance to perform tracheotomy on these children is illogical and unfortunate. The risks of tracheotomy are far less than the risks of nonsurgical management, and after tracheotomy the prognosis improves considerably.

—*John R. Lindsay, M.D.*

Staphylococcal Parotitis. ROBERT G. PETERSDORF, BEN R. FORSYTH, and DAVID BERNANKE. *N. England J. M.*, 1958, 259: 1250.

SEVEN CASES of hospital-acquired staphylococcal infection of the parotid gland are described. The infection was characterized by swelling, erythema, and tenderness in the parotid region associated with fever and very high white cell counts.

The authors believe that the infection ascends from the mouth with dehydration and debility acting as predisposing factors. Evidence of this lies in the fact that in the 3 patients who had staphylococcal sepsis elsewhere, culture showed that the organism cultured from the parotid gland was of a different phage type than that of the systemic infection. Surgery, of itself, did not seem to be a predisposing factor.

Therapy consisted of massive administration of the appropriate antibiotics, usually novobiocin and vancomycin. —*Irwin D. Horwitz, M.D.*

PHARYNX

Malignant Lesions of the Nasopharynx. PAUL W. SCANLON, KENNETH D. DEVINE, and LEWIS B. WOOLNER. *Ann. Otol. Rhinol.*, 1958, 67: 1005.

IN THEIR INTRODUCTION to this article the authors claim that malignant lesions of the nasopharynx are always a challenge, from both diagnostic and therapeutic aspects, and are the most commonly misdiagnosed, most poorly understood, and most pessimistically regarded of all tumors of the upper respiratory tract. They then recount a series of 88 cases of primary cancer of the nasopharynx seen at the Mayo Clinic between 1945 and 1949, and review the literature concerning this condition. Their cases showed a ratio of 4 males to one female; the peak of incidence was in the fifth and sixth decades, while the ages ranged from 5 to 78 years.

Many of these tumors are poorly differentiated, and classification difficulties diminish the value of statistics; however, the authors found recognizable elements of squamous cell carcinoma in 19 per cent of their cases, 67 per cent of them were undifferentiated and described as lymphoepithelioma (whether the cell type was lymphoepitheliomatous or of the transitional cell type), and 5 per cent were lymphosarcomas. Only 23 per cent of the cases were diagnosed before the development of symptoms indicating metastasis or spread to the base of the skull, but only one case was asymptomatic at the time of diagnosis. Metastasis to the retropharyngeal nodes occurs early, but the later spread to the superficial glands is usually the first recognizable sign of lymph node metastasis. Spread into the middle fossa is common, particularly via the foramen lacerum with involvement of the third, fourth, fifth (ophthalmic and maxillary), and sixth cranial nerves. Less commonly direct spread occurs forward into the nose, paranasal sinuses, and orbit. The 4 most common symptoms in this series of cases (together with the percentage of cases having each) were head or neck pain (49 per cent), cervical adenopathy (47 per cent), loss of hearing (34 per cent), and nasal obstruction (28 per cent). Forty-two per cent of the patients had cranial nerve involvement at some stage of their disease, the sixth nerve being most commonly affected, with the fifth and ninth sharing second place.

After the exclusion of 13 patients who could not be traced and 10 whose course of radiation therapy was not completed, a relative 5 year survival rate of 23 per cent was observed. Many of these patients received topically as well as externally administered radiation, but the influence of the tumor dose was of less importance as to the outcome than the type of lesion. The 5 year survival rate in cases of lymphoepithelioma and lymphosarcoma exceeds that of the squamous cell tumors by two or three to one. The presence of local invasion or distant metastasis prejudices the outcome.

—*John R. Lindsay, M.D.*

NECK

Congenital Branchiogenous Anomalies. PAUL H. JACOBS, JUNE C. SHAFER, and ROBERT S. HIGDON. *J. Am. M. Ass.*, 1959, 169: 442.

THIS ARTICLE is a summary of the cases of 21 hospitalized patients with branchiogenous anomalies seen at the Walter Reed Army Medical Center from 1950 to 1955. Preauricular pits and fistulas were found in 7; in the other 14, lesions occurred as cysts usually at the angle of the mandible or as fistulas in the lower one-third of the neck. A short discussion of the classification, nomenclature, and embryology is given. There are 2 case reports.

Branchiogenous anomalies are of interest because of the varying clinical pictures they present after secondary infection or occlusion. In some patients, the drainage from an apparently insignificant orifice may cause pyoderma or infectious eczematoid dermatitis in the surrounding skin. Such lesions may stimulate granulomas or carcinomas. Other fistulas may become occluded and form cysts which may become secondarily infected, or in some instances they may enlarge sufficiently to produce pressure symptoms.

Although the diagnosis of a branchiogenous anomaly may be clear, at times it is difficult to evaluate the depth or extent of the associated tract, which can vary in length from 1 to 10 cm. and occasionally extend as through-and-through (skin-to-pharynx) sinuses. These sinuses may have divergent offshoots and vary in the character of their linings from stratified squamous and columnar epithelium to nonspecific fibrous tracts. In the neck they often lie in close proximity to important deep structures, such as the carotid vessels and jugular veins.

The differential diagnoses include tuberculous and nontuberculous lymphadenitis, other infectious processes, tumors of the carotid artery, hygroma, dermoid cysts, lipomas, neurofibromas, hemangiomas, and lymphangiomas.

The association of branchiogenous anomalies with other congenital anomalies noted in this reported series has been observed previously by other workers, as has the hereditary history obtained in some cases.

Adequate diagnostic studies should be carried out to evaluate these lesions prior to treatment. In order to determine their extent, the procedures should include careful probing or installation of radiopaque material followed by roentgenography. It may also be necessary, when attempting dissection, to delineate

the tracts with a stain, such as methylthionine chloride (methylene blue). The details of surgical techniques used in the treatment are not described, but it is important to emphasize that thorough surgical evaluation and competent extirpation should be carried out. Inadequate treatment of these lesions by sclerosing agents, such as phenol, or by incomplete electrosurgical measures often results in partial obliteration of these tracts with subsequent secondary infection and unnecessary scarring and disfigurement.

—John J. Ballenger, M.D.

Surgical Excision of Miniature Sialoliths in Wharton's Duct. HAROLD BAURMASH and LOUIS MANDEL. *Oral Surg.*, 1959, 12: 165.

A SIMPLE TECHNIQUE for the removal of small stones in the duct of the submandibular gland is described by the authors. The duct containing the stones is secured between two sutures placed in the floor of the mouth, one anteriorly and the other posteriorly. The authors have used black silk, which has been rendered radiopaque by immersion for several days in ethiodol, an iodized oil. The position of the stone or stones relative to the sutures can be checked on an occlusal film. This additional information eliminates uncertainty of the position of the stones. The incision is made through the mucous membrane, lateral and parallel to the duct. The duct is dissected bluntly, opened, and the stones removed. The authors assume that the procedure will be done in a dental chair with x-ray equipment readily available. *—John F. Daly, M.D.*

Reconstructive Surgery for Malignant Conditions of the Head and Neck. C. C. COLEMAN, JR. *Plastic & Reconstr. Surg.*, 1958, 22: 328.

IT IS THE AUTHOR'S POLICY to utilize the principle of resecting lymphatic pathways along with the primary lesion in cancers of the head and neck that are suitably located. This procedure often requires the removal of structures of great importance. Even though patients tolerate these destructive procedures very well physically they may become psychological wrecks as a result of them.

After mutilating surgery has been performed for the eradication of a malignant condition, particularly when the mouth and jaws are involved, reconstruction is obligatory. Such reconstruction is done primarily to restore function but should also improve the appearance as much as possible.

The usual policy is to wait 6 months to a year before plastic repair is started. This waiting period allows enough time to determine whether there is residual or recurrent tumor at the site of operation. However, immediate reconstruction can be done in tumors of low grade malignancy, especially in patients of the older age group.

Local tissues are hardly ever of sufficient quantity to repair a large defect. Flaps brought from other parts of the body for use about the mouth are usually lined with skin grafts but in an occasional instance buccal mucosa can be advanced enough to provide lining. Restoration of skeletal loss is either by prosthesis or bone graft, whichever is indicated in each particular case.

Ideally the flaps for reconstruction should be prepared before the tumor resection in cases in which immediate repair is indicated. However, preparation of such flaps causes undue delay in resection of the neoplasm. Even so, plans for the program of reconstruction should be well laid before tumor ablation. It is the opinion of the author that the surgeon who resects the tumor is the one who is best qualified to plan and carry out any necessary repair.

—W. C. Huffman, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

The Importance of the Air Shadow of the Cisterna Magna in Encephalographic Diagnosis. C. M. GREENWALD, M. EUGENIO, C. R. HUGHES, and W. JAMES GARDNER. *Radiology*, 1958, 71: 695.

THE USEFULNESS of visualization of the cisterna magna by means of air from below is brought out by the authors. They make the point that the cisterna magna is the frequent site of clinically obscure lesions without increased intracranial pressure. They outline their technique of pneumography, considering it a surgical procedure with equipment for rapid ventricular decompression always at hand. They believe that pneumoencephalography with careful attention to the possibilities of increased intracranial pressure is a safe procedure and that it has disclosed many surgical lesions which could not have been found without exploration. Without increased intracranial pressure, pneumography is considered a safer and better technique in the patient's interest.

Pentothal is used for anesthesia. Air is considered equal to any other gas for the replacement of the cerebrospinal fluid. Ten milliliters of air are introduced before the removal of the fluid is begun and thereafter, the cerebrospinal fluid is replaced with air in 5 ml. amounts and frequent pressure readings are made. The exchange is ordinarily continued until air is recovered from the needle. This is considered important if the cisterna magna is to be visualized. Scalp films are used and anteroposterior, posteroanterior, and lateral films are always made before the patient is removed from the chair. The erect position facilitates adequate visualization of the basilar cisterns and the projection of the lateral ventricles on a single lateral film. The horizontal position is used chiefly for demonstration of the temporal lobe.

Of 306 pneumoencephalograms done in the year 1956, 15 were followed by surgical exposure of the posterior fossa. Two of the 15 patients had papilledema, although a surgical lesion was present in 14. In 10 of these the air shadow in the cisterna magna either made possible the diagnosis or was helpful in reaching it. Fifteen case histories are briefly abstracted to illustrate the value of the pneumographic method. Five of the patients had tumors of the posterior fossa, 1 a spontaneous cerebellar hematoma, and 1 a meningioma at the foramen magnum. Seven patients had varying types of embryonal atresia of the fourth ventricle. In one, this interpretation of the air shadow in the cisterna magna led to a negative exploration.—*Edward B. Schlesinger, M.D.*

Pitfalls and Dangers in Cerebral Angiography and Their Prevention (Fehler und Gefahren der zerebralen Angiographie und ihre Verhütung). P. SCHÖLZEL. *Fortsch. Roentgenstrahl.*, 1958, 89: 659.

THE AUTHOR divides the complications following cerebral angiography into two categories.

COMPLICATIONS DUE TO ARTERIAL PUNCTURE

These may be manifested by spasm of the vessel. Such spasm will occur because of irritation of the glomus caroticum or because of stimulation of the sympathetic chain in the vessel wall itself. Injury of the intima may result in thrombosis of the vessel.

All this can be avoided if the head of the patient is in good position, that is, retroflexed. The rules of vessel puncture should be followed. The puncture itself should be made distally to the level of the thyroid cartilage. The inserted needle should also be flushed periodically with saline solution, during the time the surgeon is waiting for the roentgenograms. Open arteriography is usually not done.

COMPLICATIONS DUE TO THE CONTRAST MEDIA AND THEIR INJECTION

The author believes that most complications due to the contrast media are of allergic, and not of toxic, nature. Therefore, he believes that it is important that premedication of the patient should include an antihistamine. In his series of more than 200 cerebral angiograms, no allergic reaction could be observed. Most of these injections were done under local anesthesia. All of the premedication included phenergan (antihistamine) and dolosal (dolantin).

—*Frank R. Lichtenheld, M.D.*

Temporary Functional Delay in Flow in the Carotid and Vertebral Angiogram (Ueber voruebergehende funktionelle Durchflussverzoegerungen im Karotis- und Vertebralisangiogramm). G. TARNOW. *Fortsch. Roentgenstrahl.*, 1958, 89: 671.

TRANSIENT FUNCTIONAL DISTURBANCES of flow are occasionally seen in individual vessels during the course of carotid or vertebral angiograms. Two groups can be distinguished:

1. Artificially caused delay in flow and vessel narrowing in the greater arteries within the base of the skull and the neck. These usually are caused by irritation of the vessel intima. This may be caused by the needle or the injected contrast medium. It also has been caused by extravasation of dye. All these disturbances may produce changes in the roentgenogram. Such arterial spasm may show stases in the flow which cannot be explained by the pulsation mechanism. The author includes illustrations of several cerebral arteriograms which demonstrate such findings.

The presence of arterial and venous filling at the same time may be caused by "early filling" of the veins. This should occur within 3 to 4 seconds after the injection of the dye. Such "early filling" may result from short circling of the blood flow. This can be seen in tumors such as the glioblastoma multiforme, or in metastasis. The author could demonstrate the presence of arterial and venous flow at the same time. This can easily be misleading, as said before. In his films the venous flow occurred within normal limit, but the arterial filling was delayed. Because of the

delay of the arterial phase, the phenomenon of phase interference is seen, which means that arterial and venous filling is present at the same time. Therefore, such roentgenograms are not of diagnostic importance.

2. Transient disturbances of flow in the small cerebral arteries. These may be caused by organic changes in the vessel wall probably with additional spasm. The author could demonstrate one case with such a roentgen finding, in which the autopsy did not confirm either marked arteriosclerosis or cerebral metastasis. Clinical parallels with cervical migraine and so-called angiospastic insults are discussed.

—*Frank R. Lichtenheld, M.D.*

Concerning the Respiratory Record and the Measurement of Oxygen Consumption in Serious Cranial Injuries (Données relatives à l'enregistrement respiratoire et à la mesure de la consommation d'oxygène chez les traumatisés crâniens graves). J. DESCOTES and P. WERTHEIMER. *Bull. Soc. internat. chir.*, 1958, 17: 364.

USING THE METABOLIMETER of Durupt, the authors have studied the oxygen consumption in 42 gravely brain-injured patients, and from the 260 records so obtained they believe they have a tool which gives dependable indications of the patient's changing state, and particularly of the signs of failure or improvement in the intracranial vegetative centers. Not only can the changes in the type of respirations (Küssmaul, "stair-step") be observed, but also the machine will register alterations in respiratory rhythm (Cheyne-Stokes) at the same time that it registers consumption of oxygen and output of carbon dioxide. The apparatus requires an indwelling tracheal catheter (tracheotomy). The effects on oxygen consumption of restlessness, muscular contraction, hyperthermia, and hypothermia can be observed by this method. The effects of hibernation are not easily or reliably interpreted by most methods. The basal metabolic rate may be diminished but one can say the patient is truly in a state of hibernation only if there is a definite diminution of oxygen consumption. The authors believe that it is only in a hypothermia of 30 degrees C., or below, that one can observe true hypometabolism. The use of this machine frees nursing help for other duties, gives dependable data concerning the patient's progress, and is in part a guide to clinical management.

—*John Martin, M.D.*

The Urgency of Cranial Injuries (L'urgence dans les traumatismes du crâne). L. CHRISTOPHE. *Acta orthop. belg.*, 1958, 24: 35.

THE TREATMENT of gunshot wounds of the brain, of open scalp-bone-brain wounds with splintering and embedding of bone chips, and other such obvious surgical situations is, for the most part, approached with accord among surgeons, but it is the patient with the closed head injury, with or without skull fracture, who poses the greatest problem as to whether surgery is indicated, and it is this type of patient that causes the greatest disagreement as to treatment among surgeons. The author insists that deep coma and signs of decerebrate rigidity are not of themselves contraindications to immediate surgery, but rather that prompt, well-directed surgery may save a good many such patients. He depends for localization to a great degree upon the side of the enlarged pupil and the unilateral neurologic changes which are of cerebral origin. He believes that arteriography, bilaterally performed if necessary, is probably the over-all best and safest mechanical test we have today, and he uses it freely even on those patients whom others might call moribund. He does not think lumbar puncture should ever be performed when there is evidence of increased intracranial pressure, for even if no fluid is withdrawn through the needle, fluid is bound to leak through the puncture hole in the lumbar dura after withdrawal of the needle, thereby possibly producing herniation at the foramen magnum. When burr holes are placed to reveal and allow removal of clots, they should be placed bilaterally in the frontal, occipitoparietal, and temporal areas. He is strenuously opposed to hibernation induced chemically, but does cool his patients with ice packs. He prefers the intravenous injection of 15 per cent magnesium sulfate solution to combat cerebral edema, and advocates early tracheotomy since the patient's recovery depends so much upon a clear airway at all times. Fluids and metabolites must be judiciously administered according to the findings in the blood and urine. The author obviously approaches the comatose, neurologically damaged patient with a closed head injury with a good deal of courage and energy. His feeling is that some of these patients may be saved and he cites several case histories to illustrate his point; they will certainly die unless prompt and logical surgical methods are instituted early.

—*John Martin, M.D.*

The Natural History of Hydrocephalus. K. M. LAURENCE. *Lancet*, Lond., 1958, 2: 1152.

IN A MUCH NEEDED and most valuable article the author reports on 182 untreated children with hydrocephalus who have been seen by Mr. Wylie McKessock during the past 20 years. Of the entire group 89 have died; 81 are alive and their hydrocephalus has arrested spontaneously. The disease remains progressive in 9 patients and the status of 3 is unknown.

Of the patients with spontaneous arrest of the disease, 75 per cent are educable and more than 50 per cent have I.Q's above 85. Most interestingly, there appeared to be no relationship between intelligence, head size, and/or cortical thickness. Those children with the greatest physical handicap, however, scored lower on the I.Q. examinations than did those less affected.

The author stresses that this series is not representative of the worst cases, which are fatal within the first 3 months, nor of the mildest cases. He points out, however, that in view of the 46 per cent spontaneous arrest rate, the reported results of surgery in hydrocephalus may have to be reassessed.

—*Joseph Ransohoff, M.D.*

Cerebral Manifestations of Plasmocytic Myeloma (Les manifestations cérébrales du myélome plasmocytaire). M. MORIN, J. GRAVELEAU, R. PEROL, H. SCHIMMEL, and R. TESTARD. *Sem. hôp. Paris*, 1958, 34: 2663.

TWO OBSERVATIONS on the cerebral manifestations in the course of diffuse plasmocytoma are reported.

The first case was that of a 61 year old colored male who came to the Hospital Salpêtrière in Paris, France, from Guadeloupe, complaining of persistent headaches, predominantly on the right side, accompanied by tinnitus in the left ear and pain and stiffness in the knee joints. The symptoms had developed 2 years previously and earlier had been accompanied by attacks of epileptoid seizures.

The patient was in a depressed mental state. The presence of Bence-Jones bodies in the urine pointed to a diagnosis of multiple myeloma, and the sternal puncture indicated the presence of the plasmocytic type of multiple myeloma (Kahler's disease). After 2 years the epileptoid convulsive seizures returned and the patient died during such an attack.

At autopsy the surface of the brain and the arachnoid on the right side was found to be covered by a gelatiniform exudate. Microscopically this was composed of plasmocytes with an infiltration of polynuclear leucocytes. There was no definite evidence of a suppurative process.

The second case was that of a 48 year old merchant who entered the authors' service complaining of diffuse pains of such severity as to confine him to bed. The roentgenologic examination disclosed extensive osteoporotic changes and shadow defects in the bones, particularly in the vertebrae and bones of the trunk, which suggested multiple myeloma, although there were no Bence-Jones bodies in the urine. While in the hospital the patient became mentally confused with hallucinations and delirium. There were abnormal electroencephalographic findings. The patient was treated with propionate of testosterone, penicillin, streptomycin, and isoniazid. The authors do not think that the last drug was responsible for the confused mental state.

After some weeks of treatment the patient's condition began to improve. Eventually the mental state returned to normal, the pains disappeared, and the patient was discharged for ambulant treatment. He gained considerable weight, but the pronounced anemia and roentgenologic findings persisted.

In this case, also, the roentgenologic, biologic, and histologic (sternal puncture) findings were typical of plasmocytic myeloma. —*John W. Brennan, M.D.*

Experiences in the Surgical Management of Tic Douloureux. E. S. Gurdjian, J. E. Webster, and D. W. Lindner. *Surgery*, 1959, 45: 264.

The material discussed by the authors includes 25 years of experience in the surgical management of tic douloureux, based on 391 operations upon 348 patients. Bilateral tic was present in 15 patients. The distribution of the trigeminal areas involved is noted, the second and third divisions jointly being responsible in 120 patients. The various surgical procedures were outlined, the most common of which was retrogasserian rhizotomy; it was performed in 276 cases. A brief statement concerning the clinical diagnosis is presented. The surgical management is discussed.

Patients seen in their first attack were usually treated nonoperatively. Those patients who had repeated attacks with typical trigger zones and whose condition became worse were candidates for surgical treatment. The authors have used the decompression operation with good results on between 75 and 80 per cent of their patients, with a 17 per cent incidence of recurrence of pain necessitating root section. They describe and illustrate their method of decompression, which combines the extradural approach with opening of the temporal dura and subsequent division of the dura overlying the posterior root as it forms the aperture into the posterior fossa. They use alcohol injections preoperatively less and less. Medullary tractotomy, although used infrequently, has been helpful in treating the second side of the patient with bilateral tic. If root section is required for bilateral tic, the sparing of the motor root becomes of paramount importance. The authors illustrate their technique of retrogasserian rhizotomy. The complications occurring after the various surgical procedures are discussed.

There were 8 deaths in the entire series, and among the nonfatal complications there were 3 cases of cerebrovascular disease, 2 of postoperative hemorrhage, 8 of diplopia, 2 of nose ulcer, 16 of facial paralysis, and 6 of keratitis. The authors believe that surgical therapy is very satisfactory following an initial trial of nonoperative treatment, and that as a first surgical step decompression of the sensory root will be helpful. Patients who have a recurrence of pain may then be treated by section of the sensory root.

—*W. Eugene Stern, M.D.*

Prognosis in Subarachnoid Hemorrhage. Olle Höök. *Acta med. scand.*, 1958, 162: 475.

This article is only one of a series to evaluate carefully all aspects of subarachnoid hemorrhage. It is realized that comparison with other investigations is sometimes difficult because of the methods of selection of patients and also the fact that different types of hospitals will receive their patients at different periods of their illnesses. This particular series of cases consists of 152 consecutive cases obtained from the medical department of Sabbatsberg's Hospital, 21 cases from the medical department of the Serafimerlasarettet, and 80 cases from the neurologic clinic of Serafimerlasarettet. All of the cases in this series were acute cases and were seen within one week of the onset of the hemorrhage (most of the cases were seen within only one or 2 days of the onset). It is the hope of the author to be able to set some form of a normal classification that might be used in future comparisons.

These cases were seen at the hospital in the period from 1934 through 1955, and all patients were followed up by questionnaires except for one.

The early prognosis was certainly unfavorable. Approximately 12.5 per cent of the patients died within the first 24 hours, and by the end of the first week about 32 per cent had died. Of those that lived past the first week, about 40 per cent died by the end of 8 weeks. After this, however, the late prognosis was much more favorable, and for the entire length of the follow-up, varying from months to years, the average mortality rate of recurrent hemorrhages was about 12.5 per cent. If the cases were further broken down into those that were very grave or essentially moribund on admission, the mortality was 96 per cent within the first eight weeks. It was felt that in most of these cases no therapy would have been of any avail. It was also found that the prognosis was less favorable

for patients with hypertension and over the age of 50. Arteriography was not performed in all of the cases. Obviously those patients who died shortly after admission did not have angiographic studies nor did a few of the patients over 60 years of age.

An autopsy was performed on 73 of the patients. An aneurysm was found in 52 cases, arteriovenous malformation in 2 cases, and no aneurysm was found in 18 cases. Thirty-seven per cent of the patients were found to have either coronary sclerosis or cardiac hypertrophy. The correlation of aneurysms with polycystic kidneys has long been known, and in this series one case had cystic kidneys and 2 others had congenital cysts; in all 3 of these cases aneurysms were found.

Surgery was performed in 36 cases. Twelve of the patients were operated upon within one week after the hemorrhage, but 7 of these died; of the remaining 29 who were operated upon after the first week, only 3 have since died. Hence the late prognosis was considerably lower for the operative groups than for those treated conservatively.

—*Jack I. Woolf, M.D.*

Subarachnoid Hemorrhage. Olle Höök. *Acta med. scand.*, 1958, 162: 493.

The author presents an excellent follow-up study of 138 cases of subarachnoid hemorrhages in which angiography failed to reveal an arterial aneurysm or other definite source of bleeding. These cases were seen consecutively from 1934 to 1955. The follow-up investigation was carried out on all but 2 patients. The time of the initial angiographic study was quite varied in regard to the time of onset of initial hemorrhage since some of the patients were seen shortly after their hemorrhage whereas others were seen many months afterward, and 2 patients several years after the hemorrhage were still having complaints of a neurologic nature.

In the majority of cases, arteriography was not done until about 3 weeks after the hemorrhage. Bilateral carotid arteriograms were performed in all patients, and vertebral arteriography was also done in 33 per cent of the patients. Before 1950 routine anteroposterior and lateral projections were taken. Since then oblique projections have also been taken as Losstedt showed that by this technique small aneurysms might be found which would otherwise be overlooked.

The average age of the patients was about 43 years. In 38 of 110 cases in which blood pressure readings were available, a definite hypertension (175/100 or higher) was found. Several of the patients had had recurrent hemorrhages both before and a few even after diagnostic studies, but only 3 had recurrent hemorrhages after discharge from the hospital.

The late prognosis with respect to recurrent fatal hemorrhage showed an incidence of only 6 per cent. This is quite comparable to other published series in such cases and is considered quite favorable in regard to the long-term morbidity of those patients in whom arteriography has failed to reveal an aneurysm. In 5 of 10 cases of fatal hemorrhage, autopsies were performed, and an aneurysm as the cause of death was found in only 2 of the cases. The postulations of hypertensive cerebral hemorrhages, vascular anomalies, coarctation of the aorta, small aneurysms which may thrombose, and congenital defects of the muscular coat of cerebral arteries were all discussed.

—*Jack I. Woolf, M.D.*

Some Aspects of Subarachnoid Hemorrhage: A Symposium. Wylie McKissock, T. Crawford, L. V. Perrett, and J. W. D. Bull. *Brit. J. Radiol.*, 1959, 32: 79.

Clinical and Surgical Aspects of Ruptured Intracranial Aneurysms

McKissock states that subarachnoid hemorrhage is only a physical sign of various etiologic factors. Although aneurysms are by far the most common, the possibility of angiomas, intracerebral hemorrhages, and tumors must all be kept in mind.

The importance of carotid compression prior to angiography is stressed as it cannot be carried out satisfactorily after the test because of either swelling or tenderness of the neck. Angiography must be a well designed approach and usually requires special views, such as oblique, orbital, or submentovertex, in order to demonstrate as accurately as possible the actual point of origin of the aneurysm. Additional injections with compression of the opposite carotid artery should also be performed to verify cross circulation through the circle of Willis. Determination of the site of the aneurysm from clinical signs still remains very unsatisfactory.

The author states that they have certain standard principles as to the type of surgery indicated for aneurysms at specific sites. For aneurysms of the anterior cerebral and anterior communicating arteries, it is believed that ligation of the anterior cerebral artery is sufficient if the aneurysm does not fill spontaneously from the opposite side. If it does occur, then a direct attack at the aneurysm is indicated.

Aneurysms arising from the middle cerebral artery can usually be attacked directly by placing multiple clips and obliterating the sac. Aneurysms arising from the posterior communicating artery may be treated by ligation of the common carotid artery in the neck if preliminary compression of the vessel was well tolerated. Otherwise, a direct attack is made.

Even though most of the neurosurgeons in England and in Europe prefer operating after the first 2 weeks, it is thought that this fails to salvage many patients who will die during this period. Despite a higher mortality rate from earlier operations, it is thought that they are the procedure of choice at the present time since the higher mortality rate is still lower than the natural mortality of the disease.

Intracranial Aneurysms—Pathological Aspects

Crawford states that aneurysms originate from the site of an anastomosis or branching of the arteries. Once started they usually grow or enlarge relentlessly unless thrombosis occurs.

The muscular coat of the artery ceases abruptly at the neck of the aneurysm. However, the elastic lamina extends for some distance into the body of the aneurysm. The fundus, however, is formed only by an attenuated layer of thin fibrous tissue. The rupture usually occurs at the fundus (64 per cent).

There are three main factors in the pathogenesis of an aneurysm, the most important being a developmental fault in the muscular coat of the artery at the site of branching or anastomosis. In the elderly group, atheromatous plaques may occasionally be the only factor. Hypertension may produce aneurysms in vessels with only minor lesions of the media.

The Accuracy of Radiologic Demonstration of Ruptured Intracranial Aneurysms

Perrett and Bull have carefully studied 219 cases of aneurysm that were demonstrated by the pathologist at autopsy and in which arteriograms had been taken before the patient's death. Bilateral carotid arteriograms were taken of all patients after a complete medical workup and particularly the performance of a Matas' test. Local anesthesia was used unless the patient was unable to co-operate. If an aneurysm was not demonstrated, vertebral arteriography was performed 48 hours later with the patient under general anesthesia.

The main purpose of this investigation was to determine why angiography occasionally failed to reveal an aneurysm. In 9 of the patients with normal carotid arteriograms, but of whom vertebral arteriograms had not been taken, an aneurysm of the vertebral or basilar artery was found.

The prime factors of a diagnostic error have been divided into five specific groups:

1. Arterial spasm. In 5 of 23 patients, spasm of the internal carotid artery prevented the demonstration of an aneurysm. Three aneurysms of the middle cerebral artery and two of the anterior communicating artery were likewise not demonstrated because of the presence of spasm.

2. Observer error. There were 6 cases in which the original examiner had failed to see an aneurysm, but in retrospect a small aneurysm was observed in each case.

3. Inadequate examination. This group consisted of 4 cases. In 3 of the cases, the films were of poor quality, and in the fourth case insufficient projections were obtained to show the aneurysm.

4. Normal arteriograms, even in retrospect. This group also is comprised of 4 patients. In 3 of the cases the aneurysms arose from the internal carotid artery at or near the origin of the posterior communicating artery; the remaining aneurysm was situated on the anterior communicating artery. However, these were all very small aneurysms and were measured by the pathologist as 1 or 2 mm. in diameter.

5. Intact aneurysm observed, second aneurysm (ruptured) not observed. This group consisted of 4 patients. The examiner's attention had been so focused on larger aneurysms arising from either the middle cerebral or carotid artery that the smaller aneurysms of the anterior communicating artery had been overlooked. "The importance of avoiding this mistake if surgery is contemplated is obvious."

—Jack I. Woolf, M.D.

Subdural Hematoma Related to Anticoagulation Therapy. MORTON NATHANSON, HUMBERTO CRAVIOTO, and BERNARD COHEN. *Ann. Int. M.*, 1958, 49: 1368.

SPONTANEOUS SUBDURAL HEMATOMA is rare. It has been reported as occurring with blood dyscrasias and ruptured aneurysm. The authors reported it as a complication of anticoagulation therapy. Two cases of subdural hematoma in association with dicumarol therapy for myocardial infarction are described. In one case the evidence for the connection between anticoagulation therapy and the appearance of the hematoma seemed clear but in the other, it was open to challenge.

The authors believe that with the wide use of anticoagulant therapy and its complications, alertness to the possibility of involvement of the nervous system in the form of subdural hematoma is worth while.

—Edward B. Schlesinger, M.D.

Some Ideas Concerning a Series of 25 Oligodendrogliomas (Considérations à propos d'une série de 25 oligodendrogliomes). M. DAVID, J.-P. CONSTANS, and J. TUSET. *Neurochirurgie*, Par., 1958, 4: 11.

AFTER studying a series of personal cases of oligodendrogliomas and an extensive number of reports in the neurosurgical literature, the authors have come to the conclusion that the oligodendroglioma is more than a tumor apart from other gliomas simply because of its histologic nature. The tumor poses special interest so far as diagnostic tests are concerned, and its treatment and the resulting survival rates merit special consideration.

These tumors occur with a frequency of from 2 to 4.5 per cent among intracranial neoplasms. The average age of these patients approximates 40 years, the location of the tumor is most commonly the frontal lobe, and the occurrence is more common in males. They may not produce well marked focal neurologic changes, but they often do produce epileptiform attacks. One of the most characteristic pathologic features of the oligodendroglioma is the variety of histologic fields one may find: areas of apparent benign change along side those of obvious malignant transformation. Quoting Earnest and Kennohan the authors state: "The signs of mitosis do not seem to have the same meaning for oligodendrogliomas as for other tumors. Some oligodendrogliomas follow in effect a benign evolutionary plan in spite of the fact that they present mitoses and pleomorphism together with cellular anaplasia." And by no means is the tumor usually solid or with calcific masses. It may often be found to contain large, degenerating cysts or smaller ones in large numbers.

These authors believe that with modern roentgenographic methods (arteriography, pneumography) even those tumors not showing calcifications can be accurately located, and this having been done, they practice as wide an extirpation as the particular site will allow and still avoid postoperative crippling of the patient. They recognize the fact that many recurrences after wide and apparently complete removal may be caused by the tendency of these neoplasms to extend in rootlike fashion along the vascular channels.

They advocate postoperative deep roentgen therapy, or in situ application of some such radioactive substance as Au^{198}. Their results would seem to justify such intensive postoperative radiation.

—John Martin, M.D.

Two Cases of Vagal Paragangliomas (Les paragangliomes du pneumogastrique. A propos de 2 observations). J.-J. DEBAIN and H. LACCOUREYE. *Presse méd.*, 1959, 67: 129.

NONCHROMAFFIN PARAGANGLIOMAS of the carotid bodies and of the jugular glomus are fairly common entities, but other than the 2 patients whom the authors have studied there appear to be only 13 cases of jugular paragangliomas reported heretofore. Paragangliomas of the vagus nerve may occur anywhere along the nerve in the neck, but most commonly they occur near the base of the skull, in a retropharyngeal, prestyloid, or posterior subparotid location, or directly at the jugular foramen. Growing very slowly and painlessly, they may be slow in producing their eventual results, such as difficulty of speech and deglutition and eventual paralysis of the last four cranial nerves, including the recurrent laryngeal. On palpation they are usually found to be firm, smooth, painless to manipulation, but "frozen" to all the surrounding tissues. The necessity of their surgical removal becomes apparent to the patient only after the lesion is large and firmly fixed and has already produced advanced neurologic changes. Their removal is a difficult and dangerous surgical undertaking, particularly since they tend to extend intracranially through the foramen and such extension must be removed.

Of the 15 patients thus far reported, 12 were men, and the ages ranged from 23 to 71 years.

—John Martin, M.D.

Craniofacial, Temporo-Orbitomaxillary, Meningioma Operated upon in Three Stages (Méningiome cranio-facial, temporo-orbito-jugal, opéré en trois temps). B. PERTUISET, L. GUILLAUMAT, P. PIALOUX, and J. F. HIRSCH. *Presse méd.*, 1958, 66: 1863.

THE PATIENT was a 51 year old male who entered the authors' service at the hospital La Pitié in Paris, France, complaining of attacks of suffocation. He stated that the swelling of the temporal, orbital, and cheek regions on the left side resulted from beatings he had received in 1941 in a concentration camp. The slowly developing exophthalmos of the left eye and the swellings did not disquiet him so much as a sudden diminution of vision in the right eye which had appeared 2 months previously. The patient was introspective and hostile, and when operation was proposed left the hospital.

Two months later he was brought to the hospital, after being picked up on the street during an epileptic attack. This time he consented to operation. This was performed in three stages. The first operation (Pertuiset) consisted of removal of a portion of the temporal bone to expose the orbital cavity and the sphenoid sinus. The orbital portion of the meningioma was uncovered but left in place. The dura mater was dull looking and bled easily; the tumor in the cranial cavity was exposed on opening the dura. It was removed in three fragments. The voluminous and relative avascular tumor had intruded into the anterior half of the fissure of Sylvius, displacing the frontal and temporal lobes of the brain; these structures did not return to their normal position after removal of the neoplastic mass. The opening in the dura was closed by a large transplant of fascia lata.

The second stage (Guillaumat) consisted of evacuation of the tumor mass in the orbital cavity. This was accomplished without sacrificing a single muscle, but the levator palpebrae superioris muscle seemed to be invaded by the tumor.

At the third stage (Pialoux) the superior maxilla was exposed by splitting the upper lip in the midline, and detaching the gingivomaxillary mucosa as far laterally as the angle of the mouth. Through this incision the portion of the tumor which had invaded the cheek was removed, together with the lateral wall of the maxillary sinus and a newly discovered portion of the tumor which had intruded into the sinus. Despite this extensive resection, some tumor tissue remained beneath the ala magna of the sphenoid bone. The surgeon hesitated to continue the evacuation in this region because of fear of producing a cerebrospinal fluid fistula.

Later the defect in the region of the temporal bone was repaired by a bone transplant from the ilium and Dufourmentel removed a tumor mass from the lower eyelid, a mass which also proved to be meningiomatous.

At present the patient is in excellent condition; his psychic disturbances have disappeared, but the diminution of vision and the loss of smell have persisted, and he experiences some difficulty in opening his mouth.

The authors believe that, although this degree of invasion of a meningioma, even of a meningioma of the base of the skull, is exceptional, extracranial prolongations of meningioma of the base of the skull are more frequent than we are accustomed to think, and they should be sought in every case in which a meningioma is found near one of the orifices of the base of the skull.

—John W. Brennan, M.D.

SPINAL CORD AND ITS COVERINGS

The Myelographic Aspects of Discal Herniations and Protrusions (Sugli aspetti mielografici delle protrusioni e delle ernie discali). V. VALENTINO. *Riforma med.*, 1958, 72: 1409.

THE AUTHOR reviews the findings, pathologic and anatomic, in herniated nucleus pulposus. He makes a differentiation between protrusions of the disc and herniations of the nucleus pulposus.

The author believes that from a radiologic standpoint of demonstrating these pathologic conditions of the intervertebral discs the best method is by myelography with pantopaque. He reports on a series of 47 cases. The paper is very well illustrated.

—Nicholas Wetzel, M.D.

PERIPHERAL NERVES

Anastomosis of the Branches of the Facial and Spinal Accessory Nerves for Facial Paralysis. ELBERT H. CALDWELL. *Surgery*, 1958, 44: 978.

ON THE BASIS of 2 cases of facial-spinal accessory nerve anastomoses that were carried out secondary to surgery of parotid tumors, the author makes a plea for this, or some one of the other well accepted methods of nerve anastomosis, rather than the use of plastic procedures to ameliorate a postoperative facial paralysis.

Although the author believes that a spinal accessory anastomosis is preferable to a free graft repair because of the greater chance of recovery of function, he makes no comparison between the accessory and hypoglossal anastomoses. He believes, however, that there is less chance of bothersome mass movements after a nerve anastomosis than after a free nerve graft. Two excellent postoperative photographs are shown. —*Joseph Ransohoff, M.D.*

Neurological Sequelae of Brachial Plexus Nerve Block. EMMA JANE WOOLLEY and LEROY D. VANDAM. *Ann. Surg.*, 1959, 149: 53.

THE AUTHORS report on 5 cases of neurological sequelae following injection of the brachial plexus nerve. They review the literature from 1884 and present a summary of their 5 cases. The sequelae in these patients consisted of the delayed onset of variable patterns of dysesthesia and pain, together with varying degrees of sensory and autonomic impairment. The associated local disease for which the anesthetic was used, the utilization of the tourniquet, and the varying psychological factors of each case influenced interpretation of the cause of the paresthesias, dysesthesias, and pain. In none of these 5 cases was motor paresis present as a result of the anesthetic agent.

In the follow-ups of the patients subjected to brachial plexus block, of which there were 106, 53 of the patients replied to a questionnaire inquiring as to the anesthetic injection which they had received. Twenty-nine of the 53 had no complaints and would have submitted to this type of anesthesia again. Six had no sequelae but did not like the discomfort during injection. Three of these had required supplementary anesthesia for relief of pain. Seven additional patients described residual soreness or vague paresthesias, although these were transient. Four patients had persistent neurological symptoms of significant duration. These 4 were included among the 5 cases presented.

The authors point out that minor neurologic sequelae from the anesthesia may pass undiscovered. The authors suggest that although the complications from this invaluable technique are not numerous, nevertheless they may be more frequent than is generally indicated because of lack of diligence in the follow-up of possible related complications, and they may be concealed or confused with the symptoms due to the primary condition for which the anesthesia was provided. The production of local anesthesia, the need to produce paresthesias to assure a good block, and the occasional failure to achieve this were reasons for the lack of patient acceptance of the procedure. Fortunately, the neurologic sequelae that are reported have not been severe or permanently incapacitating. The authors describe their approach to the brachial plexus, their technique, and their choice of anesthetic agent; they also discuss the 19 references with which they compare their experience.

The supraclavicular approach is the method utilized. It may be associated with pneumothorax, phrenic or recurrent laryngeal nerve paralysis, Horner's syndrome, or hematoma. Hematoma formation is considered by the authors to have been responsible for certain of the complications reported. Persistent probing with the needle due to inexperience and failure to elicit the necessary paresthesia may be responsible for the hematoma formation.

The authors emphasize the need for assurance of the safety of the solutions injected. They note that when a nerve is injured chemically, damage is characteristic in that the fibers of smallest diameter are involved. This means loss of sensation to pain, and disturbances in autonomic innervation. These clinical manifestations are in contrast to the pressure syndrome following tourniquet application.

—*W. Eugene Stern, M.D.*

Anatomicoclinical Considerations Concerning Neuromas of the Brachial Plexus (Considerazioni anatomo-cliniche sui neurinomi del plesso brachiale). F. GULLOTTA, G. MAZZOLENI, and U. RUBBIANI. *Arch. ital. pat. Clin. Tumori*, 1958, 2: 60.

THE AUTHORS state that neuromas of the brachial plexus are rare, as tumors go, even though neuromas of other nerves are fairly common. They report 3 cases of their own from the material at the University of Modena and have found 27 other cases of this type of tumor in the world literature. Most of the tumors were benign.

The patients have usually noted the presence of a swelling in the supraclavicular fossa and frequently note pain radiating into the upper extremity. Varying degrees of neurologic involvement were noted. In 2 of their patients they were able to remove the tumor without producing any great neurologic deficit, whereas one patient had considerable neurologic loss. From a histologic standpoint, one tumor was thought to represent a neurinoma with an atypical reticuloalveolar structure. There seemed to be little evidence of any tendency on the part of these tumors to recur.

—*Nicholas Wetzel, M.D.*

Median Nerve Compression at the Wrist: Carpal Tunnel Syndrome. ARTHUR H. STEIN, JR. *Missouri Med.*, 1958, 55: 1197.

WHEN NUMBNESS, actual sensory loss, tingling, burning pain, or muscle weakness can be demonstrated in the isolated area of supply of the median nerve in the hand, the most likely cause of the condition is median nerve compression within the volar carpal tunnel. Because of the particular anatomy of the tunnel and its several tightly approximated contained structures, the median nerve is easily the subject of abnormal pressure. One of the common causes of the situation is fracture of the distal end of the radius. When residual dorsal angulation of the distal fragment remains, the floor of the tunnel is altered and the proximal portion of this closed space may be encroached upon and the nerve compressed. Rheumatoid arthritis, associated with proliferative changes in the synovial lining of the tunnel, may also produce compression of the median nerve. Excessive use of the wrist which results in a mild sterile type of tenosynovitis, any type of infection (especially the granulomas), and calcific tendonitis may be etiologic factors. The median nerve syndrome has also been found in conjunction with Sudeck's atrophy and acromegaly.

In addition to the patient's complaint of numbness, tingling, burning pain, and motor weakness, a posi-

tive Tinel sign, increase of the subjective signs on marked flexion or extension of the wrist, visualization of muscle atrophy, or demonstration by electromyography of a conduction deficit on the involved side may be additional means of making a diagnosis.

In most instances when the median nerve is compressed within the carpal tunnel, the syndrome can be completely relieved by adequate decompression of the nerve. To accomplish this, the entire volar carpal ligament must be sectioned, and this is best done through a longitudinal incision across the wrist, with a short transverse element in the incision as it crosses the flexion creases of the wrist. No buried sutures or ties are used; only the skin should be closed. Early motion of the wrist and fingers is important in the postoperative period. —*John Martin, M.D.*

SYMPATHETIC NERVES

Remarks Concerning the Regeneration of the Sympathetic Chain (Zur Frage der Regeneration des sympathischen Grenzstranges). KURT WEESE. *Langenbecks Arch. klin. Chir.*, 1958, 290: 155.

AMERICAN AND BRITISH WORKERS have reported relapses after operations on the sympathetic chain. It was thought that they were caused by prompt regeneration. In experimental histologic studies some regeneration occurred after simple transection of these nerves. Complete regeneration of the sympathetic nerve chain must still be proved experimentally.

To clarify this problem, the thoracic sympathetic chain in dogs was resected as well as simply transected. The postoperative scarring of these nerve stumps was later examined histologically by the Bielschowsky-Feyrter method. The following results were found:

1. After a 1 to 3 cm. resection of the thoracic sympathetic chain was done, regeneration could be observed from the caudal part extending into half of the scar.

2. Three to 6.5 months after the same procedure, when the cranial part of the ganglion stellatum was saved, regeneration of the nerve fibers extending into the cranial part of the ganglion stellatum could be demonstrated.

3. In 3 additional cases in which the whole ganglion stellatum was contained in the resected part, a few deformed nerve fibers could be seen in the scar 6.5 to 10 months later. A connection between the cranial part and the sympathetic chain was not found.

4. Simple transection of the thoracic chain was performed in 2 dogs. Marked regeneration of the nerve fibers extending into the ganglion itself could be observed 2.5 and 5 months later.

5. After transection and ligation of the thoracic sympathetic chain on the cranial side very few regenerated nerve fibers could be observed 1.2 to 3 months later.

6. After several centimeters were resected only limited regenerated nerve fibers could be observed at the cranial stump of the chain.

7. After transection of the ganglion stellatum and resection of its postganglionic branches, complete interruption was found 2 to 12 months later, when a test was made with the faradic current.

Clinical observation of 3 patients who underwent extirpation of the ganglion stellatum did not reveal any regeneration 1 to 4 years after operation. Neither could a relapse be demonstrated 3.5 to 9 years later in 5 patients who underwent surgery for resection of the lumbar sympathetic chain.

8. Regeneration of the ganglion cells could never be seen.

9. If a resection of the thoracic sympathetic chain should be done for clinical purposes, the author recommends that it always include several centimeters.

—*Frank R. Lichtenheld, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Penetrating Wounds of the Chest. RUSH E. NETTERVILLE and RAYMOND MARTIN, JR. *Dis. Chest*, 1959, 35: 62.

ONE HUNDRED AND ONE cases of penetrating wounds of the chest occurring in civilian life are reviewed and analyzed. Thirty-six cases with minimum hemothorax and/or pneumothorax required neither aspiration nor drainage. Seventeen cases required catheter suction for persistent air leak. Of these 101 cases 5 required early thoracotomy, 3 late thoracotomy for decortication, and 8 others with lower thoracic and abdominal injuries were treated by laparotomy. Indications for open thoracotomy included severe or persistent bleeding, massive clotted hemothorax, cardiac tamponade if pericardicentesis fails, sucking wounds, large wounds of the trachea or bronchi, suspected esophageal lacerations or perforations, with pleural foreign bodies (1.5 cm. or larger) and with large intrapulmonary foreign bodies, and injury or suspected injury to the diaphragm and abdominal viscera either through the chest or abdomen. Three patients required surgical decortication for empyema. Seven with clotted hemothorax were successfully "decorticated" by enzymes.

The most common complications were hemothorax, pneumothorax, subcutaneous emphysema, shock, atelectasis, and traumatic pneumonitis. There were 8 deaths, 3 of which were due to nephrosis of the lower nephron.

The authors conclude that aspiration of a hemothorax is preferable to catheter drainage, whereas in the presence of a persistent air leak catheter drainage is preferable. —*Gabriel P. Seley, M.D.*

Indications and Results in the Surgical Treatment of Pectus Excavatum. CONRAD R. LAM and GEOFFREY L. BRINKMAN. *Arch. Surg.*, 1959, 78: 322.

PECTUS EXCAVATUM, or funnel chest, is a deformity characterized by depression of the lower sternum and adjacent costal cartilages. The early problems associated with this condition are cosmetic and psychological, but later there is almost always some functional impairment. Despite the many hypotheses, the etiology of pectus excavatum is still obscure, and the only basic etiologic factor of any importance is that of heredity.

The operative procedure for pectus excavatum has become more or less standardized. The essential features of the operation are depicted by photographs and diagrams. They consist of separating the body of the sternum from the xiphoid, and the deformed portions of the lower four or five cartilages are resected to leave as much perichondrium as possible. A wedge osteotomy is made on the sternum by removing the outer table for several millimeters in a transverse direction to permit outward angulation. The sternum is maintained in the correct position by sutures placed through the periosteum of the sternum, for it has been shown that external fixation with wires and bands passed through the sternum is usually unnecessary and may provide a route for infection to enter a vulnerable wound. On 2 occasions the author has used a rib strut to hold out the sternum in cases of long-standing deformities in adults. The author stressed the advantage of a transverse incision rather than a longitudinal one because of cosmetic reasons. Among the 25 cases reported there were no operative deaths. The morbidity was not significant. On rare occasions, when the pleura was opened an intercostal drainage tube was left in place for 2 days. The aspiration of serum which collected subcutaneously was necessary in a few of the author's cases.

The optimum age for such treatment is between 2 and 5 years. Infants under the age of 2 years cannot co-operate during the postoperative period and nothing will be lost by waiting a few months. A follow-up study of the 25 patients has shown that 21 of them have results which can be classed as excellent. The other 4 have at least 50 per cent correction of the deformity. Three of these 4 results occurred in older patients. —*Gordon Madding, M.D.*

Roentgenography of the Breast. VICTOR KREMENS. *Am. J. Roentg.*, 1958, 80: 1005.

THE AUTHOR presents the rationale for examination of the breast by roentgen means and discusses the diagnostic criteria in some benign and malignant conditions.

The breast is examined by means of two views, lateral and cephalocaudad. A specially designed cone is used and appropriate markers are placed. The technical factors include target-film distance, 14 inches; 30 to 32 kv.; and 100 ma. Exposure varies from 0.6 sec. to 4.0 sec., depending upon the density rather than the size of the breast.

The indications for roentgen study include: (1) evaluation of a lumpy breast, (2) evaluation of a breast that is the site of recurrent pain without a palpable mass, (3) detection of breast cancer when suspected because of diffuse malignancy without a diagnosed primary lesion, (4) confirmation of a suspected malignant condition, (5) aid in differentiation between benign and malignant breast disease, (6) evaluation of the patient with cancerophobia, (7) evaluation of hormonal therapy in benign breast conditions, (8) study of the living anatomy and physiology of the breast, (9) determination of the possible existence of precancerous conditions of the breast, and (10) a survey project among healthy women for the early detection of cancer.

It is stressed that the roentgen examination of the breast is not intended in any instance to replace biopsy and subsequent microscopic study.

Various lesions are described with regard to their roentgenographic appearance. Adenosis varies from a small collection of indistinct fluffy or blurred opacities to an extensive and almost homogeneous density. This lesion is most difficult to interpret. It

also may mask other lesions, such as an early carcinoma, and delay recognition. Cysts and fibroadenomas may be similar. Cyst walls are uniformly smooth, but fibroadenomas may be bosselated. A cluster of cysts may simulate the latter however. Cysts seldom calcify whereas fibroadenomas occasionally do. The latter are found in somewhat younger women. A lobular or medullary carcinoma may be confused with either condition. Papillomas may be recognized when an elongated and tortuous subareolar duct is seen in relation to a nodular density. This examination is of most value when a nodule is not palpable clinically. Intraductal hyperplasia appears in the form of minute punctate calcifications scattered within the breast. A cluster or clump of these may indicate an intraductal carcinoma.

Carcinomas usually occur unilaterally and correspond to a palpable mass. The scirrhous type may show a spiculated shadow of increased density, may distort the surrounding architecture, and may be smaller than the palpable mass. The medullary type may be a sharply circumscribed rounded density, have localized irregular notchings, and demonstrate a tail effect into the surrounding tissues.

Some of the value in roentgen diagnosis lies in the ability to uncover additional information, such as a disease process in the other breast and in detecting the disease process before it is clinically manifest.

The correlation of the results of roentgen diagnosis with those of breast biopsy indicates the value of the procedure. One thousand consecutive breast examinations were performed. Of these women, biopsy was performed in 372. In the 10 with negative roentgen findings, there was no error. In the 144 who had been studied and thought to have a benign lesion, the pathologic diagnosis of benignancy was returned in 141 instances (97.9 per cent). In a second group of 65 women in whom it was felt that an unequivocal diagnosis was not possible, but whose lesions were thought to be benign, 5 showed malignant lesions. In 82 women in whom a diagnosis of malignancy was made, 81 had carcinoma.

When a shadow or shadow complex did not fall into the group of benign lesions unequivocably, biopsy was urged. Of 71 individuals in this category, approximately 50 per cent confirmation of the roentgenographic diagnosis of malignancy was obtained. It is in this borderline group that improvement is needed. —*John J. Bergan, M.D.*

Diagnostic Value of Microcalcification in Mammography (La valeur diagnostique des micro-calcifications sur les mammographies). P. MOULONGUET, J. D. PICARD, and LUCIE GASNE. *J. chir.*, Par., 1959, 77: 18.

THE AUTHORS point out that so far the most significant finding on mammography which is suggestive (if not pathognomonic) of carcinoma has been the demonstration of tiny conglomerations of minute calcific particles—so small that a magnifying glass is often necessary to see them.

They present 4 cases which negate the reliability of this finding. Microscopic examinations of all 4 specimens showed fibrocystic disease without any malignant changes. —*L. S. Cherney, M.D.*

Gynecomastia. The Origins of Mammary Swelling in the Male: An Analysis of 406 Patients with Breast Hypertrophy, 525 with Testicular Tumors, and 13 with Adrenal Neoplasms. NORMAN TREVES. *Cancer*, 1958, 11: 1083.

A SERIES of 406 cases of gynecomastia is reported from the Breast Service of Memorial Center, New York, New York; to this has been added the study of the incidence of gynecomastia among 525 patients with testicular tumors and 13 with adrenal neoplasms.

Gynecomastia occurred predominantly during puberty and adolescence, with a second highest incidence during the "male climacteric" years. The lesion was predominantly unilateral except when produced by testicular or adrenal neoplasms; nodes were enlarged in about one-third of the patients. The location of the mass was usually central (the lesion in male breast cancer is usually excentric). Nipple abnormality was rare. Trauma was recalled by 14 per cent of the patients. Twenty-four per cent were found to have, or to have had, endocrine disorders, including general endocrine imbalance and pituitary, thyroid, testicular, and prostatic disorders.

Breast cancer did not develop in any of the author's patients in whom there was a previously recorded or a concomitant diffuse breast hypertrophy.

A special study of patients with testicular tumors revealed a 10 per cent incidence of gynecomastia. There was a similar incidence associated with benign testicular abnormalities. When associated with malignant testicular tumors, gynecomastia was usually bilateral and irreversible (regression did not follow orchiectomy).

Of the 406 patients, 260 were adequately followed. Of the 136 who were not treated, 115 had complete clinical regression (85 per cent). Among the group that was observed clinically, 6 treated and 21 untreated showed no change. Of 124 treated patients (surgery, testosterone, or both), 117 showed satisfactory results (94 per cent). The high figures reflect the fact that the untreated patients were those with mild disease or those who were expected to recover spontaneously without treatment.

The incidence of mammary hypertrophy in the male as the result of adrenal neoplasms has been reported.

The etiology of gynecomastia has been discussed. Endocrine imbalance has for some time been considered the dominant etiological factor. Other conditions that may cause gynecomastia are nutritional deficiencies, the administration of estrogen or androgen for therapeutic purposes, liver disease, and testicular, adrenal, or hypophysial tumors. Trauma calls attention to, but does not cause, gynecomastia.

The differential diagnosis from cancer of the male breast has been discussed.

Gynecomastia occurs as a benign lesion that not infrequently will regress spontaneously. Preponderantly of endocrine origin, its importance rests primarily upon the fact that it may be associated with other important and serious concomitant medical problems. Any unexplained gynecomastia, especially bilateral, indicates the necessity for thorough and often extensive diagnostic studies.

This article has a very extensive historical bibliography and numerous gross and microscopic photo-

graphs are presented to round out a very excellent discussion. —*Matthew H. Evoy, M.D.*

Effect of Surgery on the Primary Lesion in Breast Cancer. BENJAMIN F. BYRD, JR., SAMUEL E. STEPHENSON, JR., and INNES A. NELSON. *Arch. Surg.*, 1959, 78: 85.

THE AUTHORS review the histories of 768 primary cases of breast cancer seen at Vanderbilt University Hospital, Nashville, Tennessee, including 696 instances given primary treatment there.

Seventy-two patients received no surgical treatment; their mean survival was 38.5 months, the poorest of any group in the series. In 90.5 per cent some type of surgical removal of the primary lesion was done, reflecting a willingness of the surgeons to carry out limited removal of advanced lesions. There were 4 simple excisions and 167 simple, 10 supraradical, and 515 radical mastectomies.

The authors have no evidence to support the general statement that breast cancer is more malignant in younger women. They agree with others that 50 to 60 per cent of the patients who undergo operation within one month of the onset of symptoms have axillary metastasis. Postoperative radiation therapy did not appreciably affect survival after simple mastectomy when the axillary nodes were uninvolved, and seemed to lessen survival when the axillary nodes had been affected. Postoperative radiation therapy increased slightly the survival after radical mastectomy regardless of the condition of the axillary nodes.

Mean survival after simple mastectomy was 32.9 months in cases with metastasis and 89.8 months in cases without; the corresponding figures for radical mastectomy were 62.0 and 112.6 months, respectively.

The authors believe that removal of the primary lesion is the only method of curing the patient with breast cancer. This is also expected to alter the host-cancer relationship in a favorable fashion.

—*Stephen W. Carveth, M.D.*

Clinical Experience with, and Results of, Excision of the Internal Mammary Lymph Node Chain in Primary Operable Breast Cancer. JEROME A. URBAN. *Cancer*, 1959, 12: 14.

MORE THAN 300 patients with primary operable breast cancer were subjected to a combined radical mastectomy in continuity with en bloc resection of the internal mammary lymph node chain. The patients were selected in that the primary lesion in most instances was located in the medial portion of the breast or beneath the areola.

Of the first 300 specimens evaluated, 44 per cent showed all nodes clear of tumor, 48 per cent showed positive axillary nodes, and 35.4 per cent showed internal mammary node involvement. In 7.7 per cent of the entire group only internal mammary node metastases were found. There were 2 postoperative deaths in the series, one from a cerebral vascular accident and the other from a perforated peptic ulcer.

Five year salvage results for 100 consecutive patients operated upon by the combined procedure are available. In this group 56 per cent had positive axillary nodes and 35 per cent had positive internal mammary nodes. The 5 year survival rate was 67 per cent and the 5 year survival rate with clinical freedom from disease was 61 per cent. This parallels an anticipated 5 year survival rate with clinical freedom from disease in 48.5 per cent of similar clinical material treated by radical mastectomy and postoperative radiotherapy.

The "triple biopsy" is not regarded as a true test for operability. A 5 year survival rate of 44 per cent and a 5 year survival rate with clinical freedom from disease of 38 per cent were obtained in 34 patients who would have been considered inoperable on the basis of the triple biopsy criteria.

—*Harvey W. Baker, M.D.*

Pulmonary Metastases in Mammary Carcinoma (Zum Problem der Lungenmetastasen beim Mammacarcinom). W. WENZ and L. A. SCHWEITZER. *Langenbecks Arch. klin. Chir.*, 1958, 290: 212.

IN 1948 Walther reported from the Pathologic Institute in Zurich that the hematogenous metastases in mammary carcinoma always take the following route: vena cava, right side of the heart, lungs, left side of the heart, and then the various organs via the arterial supply. Therefore if bony metastases are present one should always expect the presence of pulmonary lesions.

The authors investigated 50 patients with hematogenous metastases. Their findings were at variance with those in the aforementioned study. Forty-three of the patients had generalized skeletal metastases and only 13 had obvious concomitant pulmonary lesions. However, these were clinical observations, and the authors were aware that some of the patients might harbor microscopic pulmonary metastases undetectable by clinical means. The remaining findings were most likely explained by the presence of open arteriovenous anastomoses in the lung (Cain).

—*Gunars Medins, M.D.*

Survival of Female Patients with Cancer of the Breast. A Study of the Effects of Demographic and Economic Factors. BRUCE D. WAXMAN and WILLIAM T. FITTS, JR. *Am. J. Surg.*, 1959, 97: 31.

THE AUTHORS present interesting data, most of which are statistically significant, in an attempt to elucidate the demographic (age, marital status, and race) and economic factors which may affect the prognosis of breast cancer. The data were obtained from the case histories of 633 female patients with breast cancer treated primarily at the Hospital of the University of Pennsylvania from 1943 through 1951.

Most of the data suggest that the public, regardless of economic status, has benefited from the intensive educational programs aimed at early cancer detection. Although there was an increase in the early reporting of symptoms from the patients in the lower income group, there was a greater increase in the early reporting of symptoms in the higher income group. No statistically significant difference was seen in survival of the two income groups or of the two racial groups when the factor of duration of symptoms was eliminated.

A definitely increased linear relationship between the duration of symptoms and the 5 year survival existed. There was a 67 per cent 5 year survival in the pa-

tients presenting with symptoms of less than 1 month's duration, as compared to a 37 per cent survival in those presenting with symptoms of 10 months' duration. It appears that there may be an economic factor working indirectly on survival through a differential time lag in the reporting of symptoms.

Neither age nor marital status seemed to affect survival significantly. —*Stephen W. Carveth, M.D.*

TRACHEA, LUNGS, AND PLEURA

A Method for Humidifying Inspired Air in Post-tracheotomy Care. HJALMAR KOCH, CLAES ALLANDER, SVEN INGELSTEDT, and NILS G. TOREMALM. *Ann. Otol. Rhinol.*, 1958, 67: 991.

ONE OF THE DANGERS of the use of tracheotomy is the fact that insufficient warming and humidification of inspired air results in injury and drying of the respiratory epithelium, and impaired cilial action with resultant retained secretions and crust formation. The authors have devised a heat and moisture exchanger (HME) to overcome this outstanding disadvantage of the tracheotomy. A 10 cm. long heat and moisture exchanger is connected to the tracheotomy tube provided with an inflated cuff. After passing the tracheal stoma, the expired air has a temperature of 35.5 degrees C. and a relative humidity of 100 per cent, i.e., absolute humidity of 40 gm./c.m. The inspired air in this patient without a HME has a temperature of 24 degrees C. to 25 degrees C. and a relative humidity of about 35 per cent, i.e., an absolute humidity of 7 gm./c.m. After application of the 10 cm. HME for only half an hour the minimum temperature of the inspired air is found to have risen to 31 degrees C. when leaving the HME and the relative humidity has increased to between 60 and 70 per cent as a minimum. Thus, the absolute humidity of the inspired air increases 3 to 4 times after only half an hour's use of the exchanger as compared with the humidity found in experiments made without it.

The heat and moisture exchanger is based on the condensation principle. It is a tubing system in which the inspired air recaptures part of the heated humidity from the expired air. The authors describe experiments in which the efficiency of the system has been calculated for continuous simultaneous recording of the changing temperature and relative humidity of the air passing through the apparatus.

The HME is believed to be useful for clinical work and satisfies the following requirements:

There is a very small dead space; the exchanger does not increase the resistance to air flow beyond physiologic limits. It is easy to apply and to handle, and the patient is not exposed to any danger by its use. The largest possible inner surface on which the humidity of the expired air can condense and from which the inspired air is moistened has been provided. The air conditioning capacity of such a tubing system of different lengths is determined in model experiments and on patients. From the experiences acquired in these experiments the authors conclude that the exchanger with a dead space of 36 ml. and an inner metal surface of about 600 sq. cm. is preferable for adults. The moisture recovery efficiency of the exchanger is determined at 61 per cent. This gives an increasing absolute humidity of the inspired air from 7 to 29 gm./c.m. after passing through the tubing system. In other words, the absolute humidity of inspired air is only about 20 per cent below that of inspired air at the same level during normal nasal inspiration (absolute humidity 35 gm./c.m.).

—*Lloyd D. MacLean, M.D.*

Acute Thoracic Emergencies in Infants and Children with Staphylococcic Pneumonias. WILSON WEISEL and W. C. GORMAN. *Surgery*, 1959, 45: 335.

THE AUTHORS report the cases of 14 children who presented sudden tension pneumothorax in the course of staphylococcic pneumonia. There were 9 girls and 5 boys whose ages ranged from 5 days to 13 years; they were treated in the period from 1955 to 1958 and all had coagulase positive hemolytic Staphylococcus aureus as the causative organism. Only one patient had any clinical findings (tetralogy of Fallot) prior to the onset of the acute illness.

Four typical case histories are presented, in all of which upper respiratory diseases failed to respond to first choice common antibiotics and had a dramatic onset of tension pneumothorax with preterminal dyspnea, shift of the apical beat, and prostration. Emergency thoracotomy and the insertion of Fryer tubes connected to water sealed drainage brought prompt and dramatic relief.

In 9 of the cases no bacteriologic diagnosis was made prior to the appearance of the pneumothorax, in 3 no radiologic diagnosis of pulmonary disease was made, and in 3 only minor respiratory symptoms were present before the thoracic catastrophe was recognized by the authors.

The authors believe that this infection is likely to cause bronchial disease with obstruction, the formation of emphysematous cysts and possibly secondary abscess, and perforation into the pleural space. The resistance of this organism to certain antibiotics followed no consistent pattern. Immediate surgery is of utmost importance in view of the limited pulmonary reserve in children, and it produced recovery in all but one patient who developed a contralateral pneumothorax in the presence of congenital heart disease.

—*W. D. Bergman, M.D.*

Segmental Anatomy as Applied to Segmental Resection. FRANKLIN R. SMITH. *Dis. Chest*, 1958, 34: 602.

THE CONCEPT of the lung as composed of 10 bronchopulmonary segments on each side rather than two or three lobes has extended the scope of thoracic surgery. The chest surgeon now carries out planned segmental resections to eradicate pulmonary disease with the conservation of a maximum of healthy parenchyma. By definition, segmental resection is the removal of an intact solitary segment by anatomically isolating its blood supply and bronchus and after severing these structures stripping out the segment in toto. This procedure is in contradistinction to wedge excision which has no respect for anatomical nicety, although it is indicated at times, particularly for peripheral lesions.

Several diseases have definite segmental importance. One of these is bronchiectasis which starts in one or more segments and spreads to another segment only with the advent of another pneumonic episode, so

frequent in this disease. The extent of the disease can be readily determined by bronchography and the area rather neatly removed by segmental resection. Many benign neoplasms and granulomas can be so removed. When a bronchial adenoma occurs, in one out of 10 instances it is located in a segmental bronchus rather than a main bronchus. The relatively recent understanding of the nature of obstructive pneumonitis has given us this all important, often initial, diagnostic indication of bronchial neoplasm, often in a segmental bronchus.

The bronchopulmonary segments can be classified as resectable individually, resectable with difficulty, and inadvisable to resect. Taking into consideration the crossing of intersegmental lines by arteries, veins, and subsegmental bronchi, there are three segments on each side that are resectable individually in most instances: the anterior segment of the upper lobe and the superior and medial segments of the lower lobes. Resectable with difficulty individually are three segments in each lung: the apical and posterior segments of the upper lobe and the anterior basal segment of the lower lobe. Inadvisable to resect individually are: the segments of the lingula and the middle lobe, the subsuperior, the lateral and the posterior basal of the lower lobes.

The author has presented several very excellent schematic illustrations which serve to clarify his anatomic descriptions in the text.

—*Matthew H. Evoy, M.D.*

The Behavior of Residual Parenchyma in Children After Pneumonectomy (Il problema del comportamento del parenchima residuo nei bambini sottoposti ad exeresi polmanare). ANGELO EMILIO PALETTO and GIUSEPPE BESA. *Fracastoro*, 1958, 51: 515.

STUDIES devoted to vicarious hypertrophy usually do not pertain to the lungs to any great extent.

Compensatory increase of the volume of one lung is usually observed after contralateral pneumonectomy, but the precise nature of the volumetric increase has not been sufficiently investigated. The research has been confined to animals and adult individuals because in the early stages of lung surgery operations were performed almost exclusively on adults.

The authors made the observation that children adapt themselves better than adults to the new conditions created by partial or complete extirpation of one lung.

Anatomic studies, clinical observations, and experiments showed conclusively that in adults the volumetric increase of the remaining lung is due to hypertrophy of the elastic and muscular structures and not to regenerative processes. On the other hand, it appears that in children true pulmonary regeneration may take place. To support this hypothesis, the authors reproduce bronchograms taken before and after lobectomy, and report a case in which such an operation had been performed on a 7 year old girl for an abscess in the base of her right lung. One year after the operation volumetric increase of the residual pulmonary parenchyma was observed. The right middle lobe had to be extirpated on account of complete atelectasis. In the course of this operation a biopsy of the hypertrophied right upper lobe was obtained. The histologic examination of this tissue failed to reveal emphysema, bronchoalveolar dilatation, or any inflammatory signs.

—*Joseph K. Narat, M.D.*

Resection for Pulmonary Tuberculosis. J. R. EDGE and D. E. BOTTRILL. *Brit. M. J.*, 1959, 1: 276.

A SERIES of 170 consecutive patients operated upon by resection of tuberculous lesions with adequate follow-up is presented.

Those with satisfactory chemotherapy (group 1) comprised 95 patients who had continuous treatment in one course of at least 6 months before operation, with minimal doses of two of the three standard drugs. Group 2 comprised 75 patients who had either intermittent or single drug regimes, which were considered unsatisfactory chemotherapy.

Cavitation greater than 5 cm. was present in 35 per cent of group 2 and in only 14 per cent of group 1. Only 15 per cent of the specimens were culture-positive in group 1 and 52 per cent in group 2. Lesions were smear-negative and culture-negative in 33 per cent of group 1 and in 15 per cent of group 2.

Of the 14 culture-positive specimens in group 1, 4 were fully sensitive, 3 were resistant to all three drugs, and 7 were resistant to one drug only. Of the 39 positive-culture specimens in group 2, 5 were sensitive to all three drugs, 15 were resistant to all three, 13 were resistant to two, and 6 resistant to one drug.

If these bacteriologic studies are correlated with the indications for resection, one can conclude that the operation was definitely necessary in 3 patients and probably necessary in another 7 of the 95 patients treated by satisfactory chemotherapy. In group 2 (unsatisfactory chemotherapy), 15 patients (totally resistant) definitely required surgery, and in 19 (partially resistant) surgery was uncertain.

Follow-up showed that 94 patients of group 1 were well and only one death was due to acute gastric dilatation the day after operation. In group 2, 62 patients (83 per cent) remained well, 8 per cent have active disease, and 9 per cent died. Four of the deaths were due to tuberculous complications.

The principal indication for resection is the persistently positive sputum culture when bacterial resistance has been demonstrated. However, less than 5 per cent of the patients may develop unrecognizable resistance after good chemotherapy because of negative cultures. —*Gabriel P. Seley, M.D.*

The Indications for Surgery in Pulmonary Tuberculosis. JOHN D. STEELE. *Ann. Int. M.*, 1959, 50: 51.

IN GENERAL it may be said that surgery is indicated in the treatment of pulmonary tuberculosis when antimicrobial therapy has failed to close the cavities, or in the case of fibrocaseous residuals when it is believed they are dangerous as far as relapse is concerned. It has been shown in a large series of patients having one or more cavities at the start of chemotherapy that closure can be achieved after 8 months of chemotherapy in less than 40 per cent and after 12 months of therapy in only about 50 per cent. In the so-called "open positive" cases in which cavities remain unclosed and pulmonary secretions remain positive for tubercle bacilli in spite of adequate anti-

microbial therapy, surgery offers the only hope of controlling the disease. Indications for resection in patients with residual, stable, fibrocaseous disease vary widely in questionnaires submitted to 38 Veterans Administration Armed Forces Hospitals.

Data are presented concerning 6,290 resections performed in the Veterans Administration Armed Forces Hospitals from 1952 to 1957. There was a mortality rate of 12 per cent for pneumonectomy, 2.7 per cent for lobectomy, and 0.9 per cent for segmental resection. More recently the mortality rate for pneumonectomy has been reduced to 5 per cent. Cavitary lesions which have not closed after a reasonable trial of chemotherapy should be resected when possible. The resection of stable, residual, fibrocaseous lesions is controversial.

Collapse therapy (standard and plombage) may be preferable to resection in certain patients who are poor risks for resection either because of loss of sensitivity of the organism to the drugs or because of considerable reduction in the respiratory reserve due to extensive disease. Evaluation of long range results will have to await future follow-up studies.

—*Allan D. Callow, M.D.*

Pleuropneumonectomy in Tuberculosis. FRANK J. MILLOY, JR. and HIRAM T. LANGSTON. *Dis. Chest*, 1958, 34: 593.

SINCE March, 1954, 38 pneumonectomies have been performed for tuberculosis at the Chicago State Tuberculosis Sanitarium. Thirteen were on the right side and 24 were on the left. The authors have divided these patients into three groups according to the degree of pleural disease. In the first group numbering 9 cases, pleural adhesions were thin and bandlike, or there was a small area of fixation of the lung, usually in the apical posterior region, to the pleural gutter. In the second group in which there were 21 cases, the entire upper lobe or upper half of the lung was firmly fixed to the parietal pleura and required extrapleural separation. In the third group in which there were 8 cases, the pleural space was completely obliterated or replaced by empyema and this necessitated total extrapleural resection. In this group were also included 4 patients with preoperatively diagnosed bronchopleural fistula.

In this series of cases the lateral, or occasionally the face down position, was used and the sixth rib was usually excised subperiosteally. In the first group (those with the least amount of pleural fixation), the free pleural space was entered and the adhesions separated bluntly, or if necessary, divided with the scissors. If an area of firm fixation of lung to chest wall existed it usually was found in the posterior gutter. The extrapleural plane was entered at the edge of such an area by cutting directly into pleura against the rib cage. A finger was introduced and the pleura separated from the chest wall by blunt or occasionally by sharp dissection. The dissection was again carried intrapleurally by dividing the thin pleura around the circumference of the adherent portion. The parietal pleura thus freed was removed attached to the lung.

In the second group (those in which the upper half of the lung was largely involved in firm pleural adhesions), it was frequently possible to find a free or but lightly obliterated pleural space at the anterior end of the thoracotomy incision. Thin adhesions were separated by sharp or blunt dissection as indicated. When the lung was firmly adherent, the extrapleural plane was entered as before. The extrapleural dissection was first carried anteriorly, by blunt finger dissection if possible, toward the sternal end of the superior mediastinum. When the mediastinum was reached the pleural space was usually re-entered and the dissection carried in the posterior direction down the pleural surface of the mediastinum. When the mediastinal adhesions were dense, one of the most difficult technical points was to determine when to change the direction of dissection from the plane running medially along the chest wall to the plane running posteriorly along the mediastinal parietal pleura. If this was not done soon enough it seemed possible to damage mediastinal structures or to enter the opposite pleural cavity.

During the mediastinal dissection on the left side, the aortic arch lay behind the dissecting finger while on the right side the area of dissection was along the azygos vein. On the left the phrenic and vagus nerves were palpable behind the dissection finger as it progressed posteriorward, thus assuring that the plane of dissection was lateral to these structures. When the separation of lung and mediastinum was as complete as practicable from this direction, attention was directed to the posterior end of the thoracotomy incision. The extrapleural plane was then entered, usually at or near the edge of the incision. Blunt dissection was carried medially behind the gutter, then anteriorly over the vertebral bodies until one broke through into the field of dissection exposed from the front, or this dissection was carried as far as possible if this approach was elected as the starting point for the mediastinal dissection. At this point the operator had surrounded the lung just above its hilum, leaving the apex adherent to the dome of the pleura. These apical adhesions were then attacked in their full circumference working toward the cupola, by blunt and sharp dissection, in the extrapleural plane as required. The great vessels and other mediastinal structures were sought and avoided as the cupola was approached.

In the third group (those patients with a residual empyema or a densely obliterated pleural space), the dissection was completely extrapleural. The pleural space was never entered and the dissection was begun in the extrapleural plane at the wound edge. This plane was encountered after the periosteal rib bed had been divided. Posteriorly, the longitudinal fibers of the frequently present subcostal muscle lie between the pleura and rib. The upper portion of the lung was separated in the extrapleural plane by the technique previously described. The extrapleural plane was then entered along the inferior edge of the thoracotomy incision and the dissection carried downward to the costophrenic angle where it was frequently very difficult to separate this greatly thickened peel. The diaphragmatic and mediastinal surfaces were likewise separated in the extrapleural plane, and the hilum finally approached. Although the empyema spaces can be removed intact by this technique they were frequently entered for convenience of dissection or by

accident. In the latter circumstance the remnants of the empyema wall were ultimately excised so that healthy raw muscle, fascia, and periosteum only lined the pleural cavity. By this method, even though the empyema content had been spilled and the surface of the healthy tissue contaminated, all of the empyema wall in which the tuberculous infection was actively established was removed.

The authors consider in detail the 8 patients in whom total extrapleural pneumonectomy was performed. Five pneumonectomies were on the right side and 3 were on the left. Preoperatively, 4 of the 8 patients had bronchopleural fistulas and these patients were particularly difficult problems. The immediate postoperative condition of all the patients in this series was good considering the magnitude of the procedure. One noticeable finding was an increase of emphysema of the neck and chest wall, often with associated nasal speech (rhinolalia).

The authors conclude that from the technical standpoint, the extrapleural plane, if properly developed, is safe, and in patients with marked pleural disease, often the easier plane of dissection. In addition, one is less apt to break into thin-walled apical cavities with the added thickness of the pleura between the lung and dissecting finger. With this technique, bleeding may actually be less than in procedures in which the cut surface of peel is left in situ, for vessels in normal tissue retract more certainly than those developed as a result of inflammation. —*Matthew H. Evoy, M.D.*

Chondromas of the Lung (Zur Klinik der Lungenchondrome). G. Rothe and L. Melzer. *Zbl. Chir.*, 1959, 84: 12.

Chondromas (hamartomas, hamartochondromas) of the lung are quite uncommon tumors, but they are being found with increasing frequency now that systematic roentgenographic examination of the chest is performed in large numbers of people. These tumors may be divided into two groups: those situated peripherally, usually just under the pleura near an interlobar fissure, and those which lie centrally or are endobronchial. The peripheral chondromas are by far the more common. While these tumors are properly called hamartomas, the authors prefer the designation chondroma, because that term describes their preponderantly cartilaginous histologic structure.

Chondromas of the lung rarely cause symptoms, and are usually discovered incidentally. Those situated peripherally may become quite large without attracting attention. Cough, dyspnea, and hemoptysis may result from the endobronchial variety. Clinical diagnosis, especially differentiation from tuberculoma, carcinoma, echinococcus cyst, or solitary metastasis, is rarely possible. Peripheral location, relationship to an interlobar fissure or to the diaphragm, and homogeneous density on the roentgenogram may suggest the nature of the lesion preoperatively. The lobulated gross appearance is not apparent on roentgenographic examination. Bronchoscopic diagnosis of endobronchial chondromas is possible.

These points are illustrated in 7 case reports of surgically resected chondromas of the lung. Four of the 7 patients were females and 3 were males. The lesion involved the left lung in 4 and the right in 3. A peripheral chondroma was located in an upper lobe in 3 patients and in a lower lobe in 3 patients, and an endobronchial chondroma was found in the left main bronchus of one patient. Only the endobronchial lesion produced symptoms. The peripheral lesions were found incidentally on roentgenograms made routinely or for other disease. None of the tumors was calcified. The largest lesion was as large as an orange and the smallest the size of a cherry.

The treatment of chondromas of the lung, which grow slowly and steadily, is surgical excision. This is true especially because preoperative differentiation from carcinoma is unreliable.

—*Elmer V. Dahl, M.D.*

Some Problems of Lung Cancer—A Physician's Viewpoint. H. Maynard Rennie. *Med. J. Australia*, 1959, 1: 12.

The absolute increase in the incidence of lung cancer, particularly in males, is well documented. While the exact cause of the disease is not known, there is abundant evidence incriminating tobacco smoke in the heavy cigarette smoker. Whether he inhales or not, or whether he uses the filter-tipped cigarette or not does not seem to make any difference. It is likely that carcinogenic substances in the air we breathe play a part, particularly in industrialized areas and big cities, and even more so when associated with smog and fog. Carcinogens in the air include benzopyrine and other hydrocarbons formed from incomplete combustion of carbonaceous fuel, arsenic, radioactive fallout, and other matter.

The author makes the following recommendations:

For prevention: (1) never smoke more than 15 cigarettes a day, and (2) prevent atmospheric pollution by potential carcinogenic agents at their source.

For early diagnosis: (1) All heavy cigarette smokers should have a chest roentgenogram taken every 6 months and all films should be available for comparison, and (2) all patients with suspicious chest lesions should be referred without delay for investigation by a trained thoracic team.

For early treatment: a thoracic surgeon should be given an early opportunity to explore the chest, often before a definite diagnosis is made.

—*Harvey W. Baker, M.D.*

Some Observations on the Pathology and Treatment of Carcinoma of the Lung. John Hayward. *Med. J. Australia*, 1959, 1: 14.

Considered in terms of the total sufferers from the disease, the results of surgery for carcinoma of the lung are very poor. Perhaps 1 per cent obtain a 5 year cure. The selection of cases for surgery is of considerable importance. The single circumscribed peripheral lesion and the central lesion seen at bronchoscopy, proved by biopsy, and showing no bronchoscopic signs of inoperability are straightforward indications for early thoracotomy. At the other extreme the growth associated with bronchoscopic signs of inoperability, evident pleural involvement, or with distant metastases is obviously rejected for surgery. There are two other categories in which indications for or against surgery are less definite; those in which

the diagnosis of carcinoma is unproved or very doubtful. In view of the low salvage rate with surgery, the possibility of doing the patient considerable harm, and the little chance of doing good, the author opposes thoracotomy in most such cases.

The author does not believe that palliation can be secured in cases in which the growth is incurable but the lung is removable. Limited resections for early or peripheral lesions or in patients with cardiorespiratory complications are at times indicated.

The management of the patient with inoperable cancer or recurrent cancer requires dedication and sympathy on the part of the physician. Radiotherapy is indicated for palliation in superior mediastinal obstruction, continuous pain, and persistent incapacitating infection due to bronchial obstruction. The physician should do everything possible to get the patient to accept his limitations and maintain his hope. Above all, one should keep the patient convinced that the physician is still interested in every detail of his case and confident that, whatever symptoms crop up, he is willing and able to do something about it. —*Harvey W. Baker, M.D.*

Pleural Biopsy in the Diagnosis of Pleural Effusion. PAUL MESTITZ, M. J. PURVES, and A. C. POLLARD. *Lancet*, Lond., 1958, 2: 1349.

THE RESULTS of 228 pleural biopsies carried out on 200 patients are analyzed and discussed with relevance to current diagnostic concepts of pleural effusion.

The patients presented with either pleural effusion or thickening, and most of them were Royal Air Force and Army Servicemen seen at one of two major centers in England. A Harefield needle was used. There were no deaths, and the morbidity consisted of 1 subcutaneous hematoma, 1 small pneumothorax, and 1 secondary deposit of lymphosarcoma along the needle track. Examination of the pleural fluid consisted in naked eye examination, differential white cell count, 48 hour culture, culture guinea pig inoculation for tubercle bacilli in some but not all cases, and search for malignant cells if indicated.

The cases were divided into three groups. Group I consisted of 152 patients in whom the first object was diagnosis of the pleural fluid. Group II consisted of 36 patients in whom the cause of the pleural effusion was not the leading clinical problem. Group III consisted of the remaining cases, those with pleural thickening, with solid lesions in or near the pleura, and those with no radiologic evidence of pleural disease. The accompanying table summarizes the findings.

The authors believe the diagnosis of tuberculosis can be established in 80 per cent of the cases with tuberculous pleural effusion, and that of cancer in 60 per cent of the cases with malignant effusion. They recommend pleural biopsy as a part of the initial investigation of every patient with pleural effusion if the cause of the condition remains uncertain.

—*Stephen W. Carveth, M.D.*

TABLE I.—BIOPSY DIAGNOSES IN THE WHOLE SERIES

	No.	*Biopsy results*			
Group	*of cases*	*Tuberculous*	*Malignant*	*Not diagnostic*	*Inadequate*
I	152	70	21*	59	2
II	36	1	10	24	1
III	12	....	2	9	1
Totals	200	71	33	92	4

*Includes 1 misdiagnosis.

The Role of Thoracotomy in the Differential Diagnosis of Pleural Effusion. JAMES M. SCHLESS, HAROLD N. HARRISON, and JAMES A. WIER. *Ann. Int. M.*, 1959, 50: 11.

PRIMARY PLEURAL EFFUSION in tuberculin positive individuals has long been considered to be tuberculous until proved otherwise because of the appallingly high breakdown rate with significant tuberculous manifestations noted in patients with pleural effusion followed up for more than 5 years during the prechemotherapy era. Because of the high breakdown rate of untreated pleural effusion and the excellent prognosis with adequate treatment, it has been a natural tendency in many hospitals to treat as tuberculous all cases in which there was any doubt as to the possibility of a tuberculous cause of the effusion. The presumption of diagnosis is made because of the greater danger of withholding treatment, in spite of the fact that there has been a certain amount of unnecessary emotional trauma, hardship, and economic loss.

Diagnostic thoracotomy was thought to be a possible method whereby a higher degree of accuracy could be obtained. Sixty-three patients who received open thoracotomy for pleural disease at Fitzsimons Army Hospital, Denver, Colorado, from 1953 to 1956 have been analyzed and reviewed and form the basis of this report. The final diagnosis in 38 cases was tuberculosis. Nontuberculous pleuritis was the diagnosis in the remaining 25 cases. The tuberculin test showed positive in all patients with a final diagnosis of tuberculosis. Other skin tests such as those with histoplasmin or coccidioidin do not prove or disprove anything in the individual case. Only 21 per cent of the patients with the final diagnosis of tuberculosis had positive bacteriologic findings in the pleural fluid aspirate. Bacteriologic diagnosis based on the pleural fluid is therefore helpful only in a positive way. The incidence of positive sputum or gastric findings is too low to be of differential diagnostic value in the negative sense. Full open thoracotomy in doubtful cases seems to be more valuable than limited thoracotomy or closed biopsy technique. Nine of 25 nontuberculous cases gave significant pathologic findings which might have been overlooked had a thoracotomy not been performed.

Morphologic findings on the basis of tissue obtained at open thoracotomy are considered to be at least 92 per cent reliable in the present series in differentiating tuberculous from nontuberculous pleural effusion. These morphologic findings are unaffected even by prolonged preoperative chemotherapy in practically all cases. Bacteriologic confirmation of the morphologic findings with acid fast stain of tissue sections, smears, or cultures of resected specimens was found positive in 65.8 per cent of the tuberculous patients. A 5 year follow-up study is currently being established at the Fitzsimons Army Hospital.

—*Allan D. Callow, M.D.*

HEART AND PERICARDIUM

Rare Variants of the Points of Entry of the Vena Cava into the Heart (Text in Russian). N. V. ARKHANGELSKAYA. *Khirurgia*, Moskva, 1959, p. 93.

FAULTY ENTRY of the vena cava into the heart was considered a rare pathologic finding up to recent years. From 1641 to 1924 only 56 cases of this anomaly had been reported. Lately, however, because of the progress in heart and blood vessel surgery more cases are appearing in the literature.

The condition is usually seen in combination with other malformations of the heart and blood vessels as well as other visceral anomalies. The entry variations are multiform. The most common type, however, is the persistent left superior vena cava in combination with the right vena cava. The persistent left superior vena cava is usually seen entering either into the left auricle or into the right auricle through the coronary sinus.

Cases of total absence of the right superior vena cava have been described; in one instance there were two inferior venae cavae and in another the superior and inferior venae cavae were observed entering into the left auricle.

Quite often these venous anomalies create little or no noticeable hemodynamic disturbance, the patient not infrequently living to a ripe old age in relatively good health. However, when the congenital anomaly is a persistent left superior vena cava entering into the left auricle with the right superior vena cava either absent or very narrow, the blood from the upper part of the body must come into the left auricle and this leads to serious hemodynamic disturbance.

Three cases of faulty entries of the veins of the greater circle into the heart in combination with the dextrad division of the bulbus and patent foramen ovale are presented. In 2 cases the anomalous left superior vena cava entered the right auricle through the coronary sinus and in one the left auricle. The presence of a double superior vena cava was diagnosed in all of the patients, but the entry of the superior vena cava into the right auricle through the coronary sinus was not detected. The presence of a double superior vena cava and of a patent foramen ovale enhanced the hemodynamic disturbances which occurred in connection with the dextrad division of the bulbus cordis.

A persistent left superior vena cava coming into the right auricle through the coronary sinus in combination with a dextrad division of the bulbus cordis also is described. The clinical diagnosis of the dextrad division of the bulbus cordis and the existence of an anomalous superior vena cava was confirmed at the autopsy; however, the entrance of the left superior vena cava into the right auricle through the coronary sinus was not recognized clinically.

The hemodynamics were noticeably disturbed and explained on the basis of the widening of the lower section of the additional superior vena cava and the strength of its walls because of the flow of the blood into the right auricle. The symptom complex probably is connected with the increased pressure in the right auricle. The blood streams leaving the right superior and inferior vena cava created a whirling that was recognized as a bruit. The patent foramen ovale permitted the passage of blood through it, apparently from right to left. The flow of blood from the veins of the heart into the lower distended section of the additional superior vena cava also was impaired. This fact was evidenced by the distention of the cardiac veins, thickening of their walls, and by the formation of connective tissue. Research on the filling up of cardiac veins with latex showed a distention of the thebesian veins, supposed to be a compensatory condition aimed to improve circulation of the heart muscle. —*Stephen A. Zieman, M.D.*

Observations on Indirect Cardiac Traumatization (Zur Begutachtung indirekter traumatischer Herzschaedigungen). K. KAISER and H. SCHOEN. *Deut. med. Wschr.*, 1959, 84: 147.

IT IS DIFFICULT to prove even in cases in which no cardiac changes were demonstrated prior to injury whether indirect cardiac damage was caused by chest traumatization. In the presence of a pre-existing heart lesion there is the added difficulty of determining whether the post-traumatic cardiac changes are due to the insult or whether they present an independent progression. Another consideration deserves mention, namely, how can one differentiate trauma due to excessive hemodynamic stress from that due to other types of stress. The fact that traumatic heart damage can be reproduced in experimental animals after nonpenetrating chest injuries indicates that such lesions present a clinical entity.

The division of heart traumatization into categories of commotio cordis, contusio cordis, and compressio cordis is too artificial. Heart lesions due to indirect traumatization are not common. If trauma is to be considered etiologically, a chest trauma close to the heart should have occurred. A distant injury does not exclude such a factor as an inciting agent, but makes it less probable. A cause-effect relationship should be evident; the electrocardiographic and clinical changes must occur early and an interval of several days or weeks makes the relationship less likely. Thus, diagnosis of commotio cordis is just an impression.

The authors give their interpretation of the histories of 4 patients who were diagnosed as having cardiac damage due to indirect trauma. One patient showed changes similar to those produced in experimental animals. Left ventricular failure with pulmonary congestion was characteristic and the spontaneous regression suggested a traumatic origin. Coronary infarcts developed in the other 3 patients in association with traumatic stress. One of the patients was only 35 years old. The relationship of trauma to coronary irritability and the hyperirritability associated with coronary sclerosis is discussed. —*Karel B. Absolon, M.D.*

Use of Atrial Grafts for the Closure of Cardiac Defects. HUGH F. FITZPATRICK, PETER A. BOSSART, RONALD P. GRUNWALD, and HAROLD A. ZINTEL. *Arch. Surg.*, 1959, 78: 212.

THERE ARE many cardiac defects which require the use of a patch or graft to be adequately corrected. As the result of many studies ivalon is now the most popular material used. The "infarcted necrosis" seen histologically in homologous and autogenous atrial

grafts seems to eliminate these grafts from clinical application, but because of several theoretical and emotional disadvantages in the use of plastics within the heart a detailed study of the fate of autogenous atrial grafts used for closing cardiac defects was undertaken and is the basis of this report.

Thirty mongrel dogs underwent amputation of the right or left atrial appendage. In 12 the atrial appendage was re-sutured to the atrial wall from which it was excised. In the remaining dogs the free full-thickness portion of the atrium was tailored and trimmed as necessary to close artificially created cardiac defects in the atrial septum, right ventricle, or opposite atrium. The grafts varied from 2 to 5 cm. in diameter. All grafts were secured by a single row of continuous No. 000 silk. The animals were killed at various intervals and careful studies performed.

There were no disruptions of the autogenous atrial grafts in any of the dogs killed. Five cases are being followed up for long-term studies. The authors conclude that free full-thickness atrial grafts used to close artificially created cardiac defects serve well. These autogenous grafts remain viable after their placement. There is gradual replacement of the myocardium. They are soon traversed or invaded by blood cells across the suture line from the normal myocardium. Several possible advantages to the use of these free full-thickness atrial grafts are listed. Long-term studies of their fate are still to be completed.

—*Allan D. Callow, M.D.*

Atrial Septal Defect, Secundum. Henry Swan, Allan B. Kortz, D. Hywel Davies, and S. Gilbert Blount, Jr. *J. Thorac. Surg.*, 1959, 37: 52.

One hundred consecutive cases of atrial septal defect secundum seen at open heart operation have been analyzed and the data presented. There were 7 operative deaths among the first 43 patients; none among the last 57. The natural history of the disease, diagnostic criteria, and indications for surgery are discussed. It is urged that in the light of the safety of the operative procedure described, all patients with this diagnosis should be given the benefit of surgical repair unless the pulmonary resistance is greatly elevated. The operative techniques employed to meet the various anatomic variations are described. It is felt that at the present time hypothermia is the method of choice for the performance of these procedures.

The current status of all but one of the surviving patients is known and the data are analyzed. Eighty-one patients are symptom-free and by all means of assessment apparently cured; 3 have been benefited but still have some symptoms; 3 have small residual shunts which do not seem to be of hemodynamic significance; one patient has become centrally cyanosed because of the passage of inferior vena caval blood into the left atrium; one patient has persistent pulmonary hypertension after closure of the defect; 2 patients have residual shunts of sufficient degree to warrant reintervention.

Atrial septal defect secundum is a congenital malformation which can be diagnosed clinically with great accuracy and can be successfully treated surgically by open operation under hypothermia at a very low risk. The operation should be performed on nearly all patients with this disease during childhood, as soon as convenient after the diagnosis is made.

—*John J. Maloney, M.D.*

Creation of a Temporary Artificial Ductus for the Surgical Correction of Ventricular Septal Defects Associated with Severe Pulmonary Hypertension. Howard D. Sirak and Don M. Hosier. *J. Thorac. Surg.*, 1959, 37: 1.

A two stage operation is proposed for the surgical correction of ventricular septal defects associated with equal-pressure pulmonary hypertension. At the first stage, a large diametered graft, serving as a temporary artificial "ductus," is placed between the ascending aorta and the pulmonary artery and, with the aid of a mechanical heart-lung apparatus, the septal defect is repaired. The second stage is performed 3 to 6 months later and consists of dividing the graft and thus completing the correction of the shunt.

This approach is predicated on the principle of separating the burdens on the heart and lungs imposed by an operation of open heart magnitude from those imposed by suddenly reversing the patient's compensated pathophysiologic state. At stage 1, the cardiovascular system is called upon to make a minor physiologic readjustment coincident with an operation of great magnitude. Conversely, at stage 2, the burden is similarly minimized by using a lesser surgical procedure when the demands of physiologic compensation are likely to be most severe.

The proper selection of cases depends upon choosing patients with equal-pressure hypertension and a significant left-to-right shunt. The most helpful guides have been the activity of the pulmonary artery, as determined fluoroscopically, and the catheterization data. Age is also an important factor. The results so far have been encouraging in that 3 of the 5 properly selected patients have survived. Follow-up catheterization studies have shown a return to normal hemodynamics.

—*John J. Maloney, M.D.*

Closure of Isolated Ventricular Septal Defects with the Aid of the Heart-Lung Machine (Intracardialer Verschluss isolierter Ventrikelseptumdefekte mit Hilfe einer Herz-Lungen-Maschine). L. D. Eerland. *Thoraxchirurgie*, 1959, 6: 277.

This is a detailed report of the author's experience with closure of ventricular septal defects in 8 patients with the aid of the Lillehei-DeWall heart-lung bypass machine at flow rates of 40 to 50 ml./kgm./min. Cardiac arrest was produced with potassium citrate in these patients, and all defects were sutured directly, without the interposition of an ivalon sponge.

Surgery produced good results in 5 of the 8 patients. Three patients died. One of the latter was a 12 year old girl who had extensive pulmonary adhesions, some of which had to be separated during surgery. Postoperative intrathoracic bleeding, presumably from small blood vessels in the adhesions, caused profound shock and death. Monitoring cannulas inserted into vessels for following biochemical and hemodynamic parameters should be kept open with sodium citrate solution, rather than with heparin, to prevent repeated small additions to the circulating heparin when these cannulas are flushed.

Two patients died of left ventricular failure. In one of these, a 15 month old patient with a large ventricular septal defect, there was difficulty in reinflation of the lungs following removal of the bypass cannulas. This definitely hypoxic episode was followed by cardiac decompensation and death 2 hours after operation. The incident led to a resolution not to disconnect the bypass machine until pulmonary respiration was satisfactorily re-established. In a third patient, death from left ventricular failure followed re-exploration of the heart when the aortic blood pressure did not remain adequate despite successful closure of a ventricular septal defect.

Whether or not repeated cardiac arrest by potassium citrate plays a part in subsequent myocardial decompensation is unknown. Other facets of the use of the heart-lung bypass which need clarification include the hemolysis, thrombocyte destruction, defibrination, fibrinolysis, and denaturation of plasma proteins which have been noted. The use of hypothermia in combination with the heart-lung machine is probably unwise. The increased risk of ventricular fibrillation, necessitating electrical stimulation and massage of a surgically repaired heart, seems dangerous. —*Elmer V. Dahl, M.D.*

Clinical Experience with a Rotating Disc Oxygenator. HERBERT SLOAN, JOE D. MORRIS, RIENTS VANDER WOUDE, HOWARD HEWITT, and GRAYDON LONG. *Surgery*, 1959, 45: 138.

A ROTATING DISC oxygenator has been employed for for heart-lung bypass at the University of Michigan Medical School in 75 cases. (The number is increased to 122 in an addendum.) The authors describe mechanical and technical details of this particular type of heart-lung bypass machine and its use.

In the pH, HCO_3, and pCO_2 values obtained at various intervals before, during, and after operation in 51 cases, a uniform pattern of acid-base change was observed. Initially the patients were alkalotic as a result of hyperventilation by the anesthetist. At the start of the heart-lung bypass the pH fell toward normal but continued to be alkalotic. The average pH change from the beginning to the end of the perfusion was 0.04. After operation a combined respiratory and metabolic acidosis developed, in which the average pH was 7.29, the HCO_3 20.9, and the pCO_2 45; but the values had returned to normal the next day. No significant change was observed in the values of sodium, potassium, and chloride.

The major postoperative problems were excess pulmonary secretions and pulmonary hypertension. Tracheotomy and a positive pressure respirator were utilized in 11 cases to help eliminate the former difficulty. Postoperative bleeding was not troublesome. The usual loss for the 18 hours after operation was 200 to 500 c.c. Complete heart block occurred in 2 patients, but was relieved by sublingual administration of isuprel. Early in the authors' experience infection occurred in 3 young patients (Pseudomonas aeruginosa), which was caused by improper sterilization.

The majority of deaths in the series of 75 patients occurred (1) in infants with complicated lesions, (2) in patients with pulmonary hypertension, and (3) in cases in which technical errors were made during the operation. The deaths were not related directly to the heart-lung bypass, although the perfusion in infants was often very difficult and could not be excluded as the cause of death. Among the series of 122 were 43 patients with ventricular septal defects (of whom 6 did not survive operation), 33 patients with atrial septal defects (of whom one died), 20 patients with pulmonic stenosis (of whom none died), and 9 patients with tetralogy of Fallot (of whom 3 died).

—*Stephen W. Carveth, M.D.*

A Disposable Screen Oxygenator. GERALD A. DIETTERT, BERNARD A. BERCU, WILLIAM H. DANFORTH, and ERNEST E. PUND, JR. *Ann. Surg.*, 1958, 148: 959.

AN INEXPENSIVE and disposable vertical screen oxygenator which can be sterilized by autoclaving has been designed and tested in a series of animals. The case and top chamber are fabricated from cast vinyl film. Oxygen inlet and outlet tubes and arterial and saline outlets are incorporated in the case. The eight screens are standard aluminum window screening measuring 12 by 24 inches. The metal bars are made of standard stock sizes of aluminum bar, which is cheap, durable, and easy to machine. The unit is easily assembled by clamping the screens between the upper bars which form the floor of the top chamber. The number of screens employed may be reduced by simply omitting them during the assembly. Similar bars are clamped to the lower edge of the screens to separate them and to minimize the volume of blood in the arterial reservoir in the bottom of the case. Adjustable rods at the four corners, extending between the upper and lower bars, keep the screens taut. The slots in the floor of the top chamber, which admit the film of blood to the screens, are formed by the screen thickness. Thin rubber shims prevent leakage from the ends of the slots.

The plastic top chamber is pyramidal in shape. It has a venous inlet tube and an outlet to evacuate air during filling. An aluminum stand supports the assembled unit. Removable lucite panes form the bottom and sides of this stand to prevent the flexible case from bulging during the initial filling with physiologic saline solution.

Sigmamotor finger pumps, their speed manually controlled, have been utilized as arterial and venous pumps. A recirculation pump, as originally described by Gibbon, is used to maintain a constant flow of blood over the screens regardless of the speed of the other pumps. The introduction of a depulsator between the recirculation pump and the oxygenator insures a stable blood volume in the top chamber by providing an almost nonpulsatile flow. The venous and coronary sinus reservoirs and all connecting tubing are of plastic. The filter, placed between the arterial pump and the subject, is a fine-meshed monel-screen cone enclosed within a tube. Two infrared lamps, placed about 18 inches from the oxygenator, maintain the temperature of the blood and prevent condensation of water vapor on the inside of the case.

The maximum flow which can be obtained with this eight screen model is 3.5 liters per minute. The recirculation pump is routinely set at a speed fast enough to keep the top chamber filled and to exceed the speed of the other pumps. The number of screens

employed is determined by the size of the experimental animal. Depending on the number of screens used, from 1,500 to 2,200 c.c. of blood are needed to prime the unit. No difficulty has been encountered in producing or maintaining a blood film on the screens. We have not seen or discovered in the literature any evidence of untoward effects on the blood from contact with the aluminum.

A 97 per cent oxygen and a 3 per cent carbon dioxide gas mixture flowing at 10 liters per minute proved to be satisfactory for respiratory gas exchange.

The oxygenator and other parts of the extracorporeal system may be sterilized by autoclaving. After use, the screens, plastic case, and top chamber may be discarded. Only the metal parts and stand are reused. —*Matthew H. Evoy, M.D.*

Surgical Treatment for the Tetralogy of Fallot by Open Intracardiac Repair. JOHN W. KIRKLIN, F. HENRY ELLIS, JR., DWIGHT C. MCGOON, JAMES W. DUSHANE, and H. J. C. SWAN. *J. Thorac. Surg.*, 1959, 37: 22.

EXPERIENCES with open intracardiac repair for the tetralogy of Fallot are described together with details concerning the factors contributing to death in the hospital and later. The operation, perfusion, and postoperative management must be done with precision if the best results are to be obtained.

The excellence of the late results and the reasonable, although significant, operative mortality render open intracardiac repair an effective treatment for the tetralogy of Fallot. A longer follow-up of a larger series of cases will be required finally to establish whether it will replace all other operations for this lesion. Yet it is, in the opinion of the authors, at present the treatment of choice.

—*John J. Maloney, M.D.*

A Report on 44 Open Heart Surgical Procedures Performed with an Extracorporeal Circuit (Quarante-quatre interventions à coeur ouvert sous circulation extracorporelle). CH. DUBOST, PH. BLONDEAU, CL. LENFANT, M. WEISS, and Others. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 289: 266.

THE FIRST 18 operations were performed with a Lillehei-DeWall heart-lung machine which was modified by the authors to provide an output up to 1,500 c.c./min. It was felt to be inadequate and in the remainder of the procedures the Melrose type disc oxygenator was utilized, permitting an output up to 4,000 c.c./min. In 8 cases cardiac arrest with potassium citrate was used. The following results were obtained:

Procedure	*No. cases*	*Deaths*
Atrial septal defects	19	0
Atrioventricular canal	4	2
Interventricular septal defects	7	4
Single ventricle	1	1
Pulmonary stenoses, valvular	4	0
Pulmonary stenoses, infundibular	4	4
Tetralogy of Fallot	2	1
Aneurysm of the sinus of Valsalva	1	0
Mitral insufficiency	1	1

The auricular septal defects included defects of the ostium primum and the ostium secundum. In large lesions an ivalon prosthesis was utilized. One defect in a patient with marked pulmonary hypertension was treated with a perforated ivalon patch to permit a gradual adjustment to the hemodynamic changes.

The atrioventricular canal lesions consisted of large auricular septal defects extending down to the interventricular septum and connected with valvular malformations. The two deaths were due to a transfusion accident and to a technical failure to cannulate the venae cavae.

Open heart surgery permits an excellent anatomical result in valvular stenosis of the pulmonary artery. The authors point out the possibility of coexisting valvular and subvalvular stenoses. They operated upon one patient who had had Brock's closed procedure previously during which the valvular stenosis was repaired but the subvalvular stenosis not noticed.

Infundibular stenoses of the pulmonary artery are severe malformations which require considerable surgical ingenuity and ability to improvise in the operating room. Each case is anatomically different and has to be treated on its own merits. All 4 patients in the authors' series died either because of not enough or too much surgery. It is hoped that further experience will teach the amount of correction which will not cause an overload of the pulmonary circuit.

Cardiac arrest and ivalon sponge were used in most cases of interventricular septal defect for a perfect anatomical result. The danger of sudden postoperative hemodynamic changes was realized as probably being due to overloading of the left ventricle and sudden pulmonary engorgement. Patients with elevated pulmonary pressure due to increased pulmonary output preoperatively constitute good operative risks. Patients with elevated pulmonary pressure due to proliferative changes at the arteriolar level and with low pulmonary output are poor surgical risks. To avoid these sudden postoperative hemodynamic upsets an opening was left in the ivalon patch, to close spontaneously at a later date.

The duration of the bypass varied from 7 minutes (auricular septal defect) to 90 minutes (interventricular septal defect). The output varied from 300 c.c./min. (6 kgm. body weight) to 4,500 c.c./min. (62 kgm. body weight). —*Gunars Medins, M.D.*

Bacterial Endocarditis After Surgery for Acquired Heart Disease: Report of 2 Cases and Review of the Literature. F. G. HOFFMAN, S. L. ZIMMERMAN, E. A. BRADLEY, and B. LAPIDUS. *N. England J. M.* 1959, 260: 152.

THIRTY-EIGHT CASES of bacterial endocarditis after operation for acquired heart disease are analyzed. Two cases of the authors are presented in detail; the patients were a 34 year old male with mitral insufficiency who had a cardiotomy and a 30 year old male who had a finger fracture of the mitral valve. The endocarditis did not develop until 9 and 10 months, respectively, after surgery. Mitral aortic or combined mitral and aortic valve surgery was performed.

The causative micro-organism was the Staphylococcus aureus in 26 cases. The coagulase-negative strains seemed to predominate (15 to 11) and carried a

higher mortality (8 to 5). It seems that an extracardiac source was responsible in the early (1 to 4 week) endocarditis. Bacterial endocarditis is probably infrequent after cardiotomy (well under 1 per cent). Various antibiotics, usually including penicillin, have been employed in treatment. The mortality rate was about 35 per cent compared with a reported 50 per cent for staphylococcal endocarditis unrelated to surgery. The only persistent findings in this atypical endocarditis were fever and septicemia.

Pericarditis, changing heart murmurs, splenomegaly, and the petechial and embolic phenomena usually associated with bacterial endocarditis were rarely present and made the diagnosis difficult. Further studies as to cause and treatment are indicated in an effort to reduce the mortality of this serious complication. —*Gabriel P. Seley, M.D.*

Complications Observed in a Follow-Up Study of 100 Operations for Mitral Stenosis; A Critical Contribution to the So-Called Postcommissurotomy Syndrome (Komplikationen der internistischen Nachbehandlung bei hundert operierten Mitralstenosen; Ein kritischer Beitrag zum sogenannten "Postkommissurotomie-Syndrome"). M. FRANKE and W. KAUFMANN. *Münch. med. Wschr.*, 1958, 100: 1765.

TWENTY-SEVEN PATIENTS of a group of 100 who had commissurotomies at the Surgical University Clinic in Marburg, Lahn, Germany, from 1952 to 1957, are discussed. The postoperative complications of the 27 patients included acceleration of the erythrocyte sedimentation time, fever, leucocytosis, local pains, increase in the antistreptolysin titer, joint pains, electrophoretic changes, pleural effusion, and carditis.

The authors admit that a general summary of the frequency and character of these symptoms does not furnish any clue to the etiologic factors; however, an analysis of the individual case histories does furnish clues to such a differentiation.

On the basis of their analysis of the individual cases they divide the material into 16 instances of a reactivation of the original rheumatic process, and 11 instances in which the response to the trauma of operation either was obvious, that is, identical to that following all thoracotomy operations, or the etiologic distinction was difficult (6 cases).

In the rheumatic reactivation group are included those instances in which the symptoms developed following a quiescent period several weeks after the commissurotomy operation, the manifestations were more of a general character, such as joint pains or pleuritis on the nontraumatized side, and those cases in which there were disturbances in the blood sedimentation, electrophoretic, and antistreptolysin readings, and the condition was found to be typically resistant to treatment.

In the localized traumatic group, where the rheumatic factor was definitely not present, the manifestations (pleuritis, pericarditis, and local abscesses in the chest wall of the operated side), occurred in the immediate postoperative period and were readily amenable to treatment.

On the basis of this study the authors doubt the justification of other investigators (predominantly American) in classifying all these postcommissurotomy manifestations under the single designation of "postcommissurotomy syndrome." —*John W. Brennan, M.D.*

The Diagnosis of Intra-Auricular Tumors and Large Thrombi by Means of the Ultrasonic Echo Method (Diagnostik intraaurikulaerer Tumoren und grosser Thromben mit dem Ultraschall-Echoverfahren). S. EFFERT and E. DOMANIG. *Deut. med. Wschr.*, 1959, 84: 6.

THE FIRST PATIENT was a 44 year old man who came to the authors' service at the surgical clinic of the Medical Academy of Duesseldorf, Germany, with the diagnosis of a combined mitral lesion with a predominating mitral stenosis. The patient was practically unable to get about; the left atrium was markedly dilated and the auricular fibrillation was complete. The second heart tone was doubled and a mild systolic murmur and a short protodiastolic sound were audible. The symptoms were becoming progressively more severe. Roentgenologically pulmonary stasis was revealed; however, the right side of the heart was not noticeably involved.

At the first operation, intended to be a commissurotomy, there were encountered a wide mitral ostium incapable of closing and a small fist-sized tumor attached to the septum of the auricle, which obstructed the mitral ostium in a valvelike fashion. This tumor could not be removed without an interruption of the circulation.

Five months later, with identical preoperative preparation of the patient, but under hypothermia, the operation was repeated; the auricle was widely opened and under temporary circulatory interruption, the tumor was removed by morcellement in 3 pieces.

Following the second operation the cardiac murmurs and the reduplication of the heart's second tone ceased, the normal cardiac rhythm was re-established, and the dyspnea was relieved.

The second patient, 30 years old, was also operated upon for the relief of an assumed mitral stenosis. When the auricle was opened, a huge thrombus which was partially obstructing the atrioventricular aperture was found. This could not be removed without temporarily interrupting the circulation at this point.

At the second operation, since the left auricular appendage could not be used for the approach to the thrombus, the right auricle was widely opened and the interauricular septum was incised. Through this incision the egg-sized mass was removed. However, it was found that there was also a stenosis of the mitral ostium, which consisted merely of a slit 1 cm. in length. The additional commissurotomy procedure resulted in increasing the ostium to two-thirds of its normal size.

Up to the present time these preostial obstructive lesions causing a hindrance to the flow of the blood from the left atrium into the left ventricle have been a surprise finding for the surgeon who has opened the heart for the purpose of doing a commissurotomy for a presumed mitral stenosis. Since the treatment for the relief of mitral stenosis and that required for the conditions here reported are different, the advantage of a reliable differential preoperative diagnosis is obvious. The possibility of using the ultrasonic echo

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method for this differential diagnosis was studied by the authors.

The ultrasonic echo method consists essentially in the emission of ultrasonic waves (quartz crystal) and registration of the echo from these waves on the screen of a cathode ray tube by means of an apparatus (Siemens—Reiniger). The echograms of the 2 patients were abnormal. The authors state that in their approximately 300 echographic examinations they have never encountered tracings even faintly resembling those on the echogram of the first patient.

In the normal tracing there was seen the inverted W-like elevations of the echo-tracing, while in the case of myxoma the notching of the inverted W was transformed into a plateau at the top of the tracing. The hollow of the inside of the inverted W was also filled almost completely with the shadows of the echo. The authors admit that such an image might possibly represent an artifact resulting from too much amplification, and they believe that with sufficient experience these artifacts can be eliminated; however, there still remains the problem of determining whether the diagnostic method will be reliable in all cases of premitral obstructive lesions.

—*John W. Brennan, M.D.*

ESOPHAGUS AND MEDIASTINUM

Three Cases of Foreign Body, Needle, in the Esophagus (Su tre casi di corpi estranei, aghi, dell' esofago.) VINCENZO VERACE and GIUSEPPE BARRANCO. *Gior. ital. chir.*, 1958, 14: 678.

IN EACH OF these 3 patients the symptoms appeared suddenly during the process of swallowing food. The symptoms consisted of sudden onset of pain at the base of the neck or throat, immediate dysphagia, and a feeling of a foreign body in the throat; in one instance in which the needle had passed out of the esophagus upward and to the right, there was radiating pain to the right shoulder.

The roentgen examination showed the foreign body in every instance to be a needle; in 2 the needle was threaded. In each case the needle had passed through the wall of the esophagus. One patient had pulled at the thread until it broke, without removing the needle; in another the thread could be seen through the esophagoscope and was grasped and the needle thus removed. In this patient the symptoms were immediately relieved; however, a week later he returned complaining of dysphagia, pain, and fever and had to be operated upon. A large amount of putrid pus was drained from behind the esophagus and the patient then recovered completely.

In the other 2 patients the needle had to be removed operatively. In one, the needle was found in the periesophageal tissues by palpation with the index finger, aided by the insertion of a bougie into the lumen of the esophagus. In the other patient, the needle was embedded in the prevertebral muscles and could be found and removed only with the aid of peroperative fluoroscopy. In these 2 instances the esophagoscope was of no particular assistance. These patients recovered, following postoperative drainage for a couple of days, without either immediate or subsequent complication.

In conclusion the authors state that whenever a foreign body has been present in the esophagus for a considerable period of time (in these cases the elapsed periods were 4, 7, and 14 days), especially when the foreign body is of such a nature as to cause injury to the esophageal wall, surgical intervention is clearly indicated.

—*John W. Brennan, M.D.*

The Control of Bleeding from Esophageal Varices Using a New Compression Tube (Beitrag zur Behandlung schwerer Oesophagusvarizenblutungen mit einer neuen Kompressionssonde). K. KRENTZ. *Münch. med. Wschr.*, 1959, 101: 130.

THE MOST COMMON CAUSE OF DEATH in cirrhosis of the liver next to hepatic coma is bleeding from esophageal varices. The treatment of shock with sympathomimetic drugs and whole blood may activate a spontaneously arrested hemorrhage. The clotting defect, predominantly manifested by a defect in prothrombin synthesis, creates a situation even more favorable for recurrent bleeding. Intraesophageal injection of varices with thrombotic agents may create a new bleeding site and paravenous injections of dextrose-glycerine have therefore been recommended. Shunt operations, such as portacaval and splenorenal anastomoses, are of little use in acute bleeding episodes and are rather of prophylactic value. K. Westphal (*Deut. med. Wschr.*, 1930, 1135) was the first to treat esophageal varices with compression, using a balloon type tube originally designed for treatment of cardiospasm. Senkstaken improved on the immediate therapy by introducing a double balloon tube. An even greater improvement in therapeutic results was achieved with simultaneous application of thrombotic agents; active thrombin causes the plasma soluble fibrinogen to transgress into the insoluble fibrin, and tissue extracts supplying thrombokinase cause activation of the prothrombin→thrombin step.

The author's tube is similar to that of Senkstaken, but it includes an additional compartment for injection of the thrombotic agent. The tube is introduced and the distal balloon extended in the distal esophagus rather than the stomach; the injection of the thrombotic material follows. The final maneuver is the distention of the proximal balloon.

The author uses dolantin for sedation and warns against the use of antihistaminics and other potentially hypotensive agents which may precipitate a depression of liver perfusion and hepatic coma.

—*Karel B. Absolon, M.D.*

Palliative Treatment of Esophageal Carcinoma. WILSON WEISEL, FORRESTER RAINE, RAYMOND R. WATSON, and J. J. FREDERICK. *Ann. Surg.*, 1959, 149: 207.

THE AUTHORS describe an intubation method which has been employed in 103 patients with far advanced esophageal carcinoma and in whom curative procedures could not be accomplished. All had obstructive lesions and the diagnosis was confirmed by endoscopic biopsy (98 patients) or from tissue obtained at thoracotomy or laparotomy. Once inoperability has been established or anticipated, the lesion is dilated to size 38 or 41 French and a bougie is inserted into the lower esophagus or stomach through an esophagoscope. A specially prepared semirigid polyethylene

tube flanged at the proximal end (13 by 10 mm. diameter) is inserted over the bougie and forced into position by the esophagoscope. It is held in place by the tumor alone.

In all of the cases the patients had relief from their obstruction and harassing cough, could take oral feedings and medication, and survived for mean periods of 8.5 months. No deaths occured due to intubation, but 18 patients showed morbidity which was attributed to mediastinal contamination and pneumonitis. The tube was spontaneously dislodged in one patient only.

Autopsy examinations were made on 35 of these patients. There was very little reaction at the site of the tube and in 2 instances mucosal prolapse occurred into the proximal opening of the tube. In one case the posterior esophageal wall was completely perforated by tumor and the tube actually lay within the mediastinal space. The patient was, however, able to eat regularly up to the time of death.

Ten case reports with roentgenograms are given in detail to illustrate the technique and the palliation achieved. —*W. D. Bergman, M.D.*

Mediastinal Chemodectoma. THOMAS J. MADDEN. *Ann. Surg.*, 1958, 148: 943.

THE AUTHOR presents the case of a mediastinal tumor of aortic body origin occurring in a young woman. After learning the true diagnosis of this tumor, a review of the literature was made, only to find that the tumor known as chemodectoma is extremely rare.

The aortic bodies are groups of "epitheloid" cells, resembling the carotid bodies, located in the vicinity of the aortic arch and pulmonary artery. Like the carotid bodies, the aortic bodies are sensory organs involved in the maintenance of normal arterial oxygen tension, through the reflex adjustments of respiratory rate and depth, sympathetic nervous system activity, and cerebral cortical activity. Afferent impulses via the vagus nerves are produced by hypoxemia, hypercapnia, and the various drugs reaching the aortic bodies.

The tumors are spherical or ovoid, circumscribed, often encapsulated, and firm or rubbery. They are usually richly vascular, often with a network of large thin-walled vessels covering the external surface. When located near a large artery the tumor may be intimately bound to the adventitia or may actually surround the vessel, as was the case in the patient presented, from whom a section of the innominate artery had to be removed because of injury during excision of the tumor. Section showed tan, gray, or pink homogeneous tissue, usually traversed by blood sinuses and fibrous trabeculae.

The microscopic structure was like that of carotid body tumors. The tumors are known to grow slowly, and even after incomplete removal a long-term survival may be expected.

It is the impression of the author that cancer in aortic body tumors is the exception, and in this respect they seem to resemble carotid body tumors and tumors of the glomus jugulare.

The treatment of these tumors is very similar to that of carotid body tumors, for which the morbidity and mortality rates may possibly outweigh the advantages of removal of the tumor. However, inasmuch as radiation treatment is ineffective, as soon as the diagnosis of a chemodectoma is established, the decision to attempt excision or not should be guided principally by the surgeon's evaluation of the danger to vital structures entailed in the surgical procedure. It is likely that the new developments in vessel grafting and prosthetics will have important applications in the treatment of these tumors.

—*Matthew H. Evoy, M.D.*

Ganglioneuromas of the Mediastinum (I ganglioneuromi del mediastino). LUCIANO URSO and DENIS DONDEI. *Ann. ital. chir.*, 1958, 35: 353.

THE AUTHORS reviewed the literature on ganglioneuroma of the mediastinum and found a total of 162 cases. They present 3 additional personal cases. These tumors are more frequent in women and in the first two decades of life. There is some argument as to their cellular origin in the opinion of the authors. Most often they are located in the posterior mediastinum and in 40 per cent of the cases symptoms are absent. The treatment is surgical removal. The occasional dumbbell protrusion into the vertebral canal of these tumors should be kept in mind. The reported mortality is 3.5 per cent. —*Alexander J. Conte, M.D.*

MISCELLANEOUS

Thoracic Surgery Under Paravertebral Block Anesthesia and Local Infiltration of the Mediastinum (Die intrathorakalen Eingriffe unter paravertebraler Nervenblockade und Mediastinuminfiltrationsanaesthesie). HUA-YU SHEK. *Thoraxchirurgie*, 1958, 6: 191.

THE AUTHOR names the following advantages of local anesthesia for thoracic surgery:

1. Toxicity of the general anesthetic agents is avoided.
2. The cough reflex is maintained.
3. Extreme simplification of the anesthetic technique is achieved; there is no need for an anesthesiologist.
4. The patient is alert, not depressed. There are fewer postoperative complications.

The author used local anesthesia on 163 patients, age 14 to 54. The procedures included: pulmonary resection, decortication, thoracoplasty, ligation of patent ductus arteriosus, and mitral commissurotomy.

He uses a mixture of 0.5 per cent procaine and 0.05 per cent pantocain with added adrenalin. The technique consists of 3 stages:

1. Block of the intercostobrachial nerves in the first and second intercostal spaces close to the sternum.
2. Block of the first to eighth or tenth intercostal nerves and of the sympathetic chain in that area. Site of the injection: 3 fingerbreadths lateral from the dorsal midline.
3. Infiltration of the mediastinum with 100 to 200 c.c. of the anesthetic solution after entering of the chest and freeing of the adhesions. The anesthetic action lasts about 6 hours. The occasional case of dyspnea after opening of the chest was controlled by oxygen. The cough reflex disappeared after the mediastinum was infiltrated. No positive pressure respiration was utilized.

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Ninety-nine patients experienced no dyspnea during the procedure and therefore needed no oxygen. The author concludes that this anesthetic technique is a valuable addition for thoracic surgical procedures.

—Gunars Medins, M.D.

The Risk of Thromboembolism in Surgery of the Thorax, Its Prevention and Treatment (Le risque thrombo-embolique dans la chirurgie du thorax, sa prévention et son traitement). H. Le Brigand and J. Moreaux. *Poumon*, 1959, 15: 49.

In the last 10 years there has been no progress worth speaking of in the prevention of postoperative embolism.

The authors report 40 cases of fatal embolism in 3,723 thoracic operations, representing 1.0 per cent. Pneumonectomy carried the highest risk—4.7 per cent, lobectomy—average, segmental resection and decortication—one death each in 270 and 159 cases respectively. Pneumonectomy for tuberculosis entailed only an average risk, whereas pneumonectomy for cancer or abscess gave a fatal embolism rate of 5.9 per cent and 6.6 per cent respectively.

There is no reliable test for the recognition of candidates for this mishap. In analyzing 423 patients whose complications ranged from phlebothrombosis to fatal embolism, the authors discovered that increased blood coagulability increased the risk, but coagulability below normal was not a guarantee of safety. Prothrombin determinations and sedimentation rates were of no value.

As prophylaxis, the usual measures of arm and leg motion, early ambulation, and respiratory exercises were employed. At the first suspicion of phlebothrombosis, tromexan was given; if symptoms were definite, the patient was also heparinized. Previous phlebitis warrants prophylaxis. *—L. S. Cherney, M.D.*

Tumors of the Thymus (Tumores del timo). Guillermo A. Lacour. *Prensa med. argent.*, 1958, 45: 2619.

Tumors of the thymus are relatively rare. In 300,000 case histories studied at the Lahey Clinic, Boston, Massachusetts, only 6 thymus tumors were found. This is probably the largest case study presented; however, smaller series have shown proportionately similar statistical evidence. Sarcoma, fibroma, myxoma, lipoma, lymphangioma, carcinoma, and epithelioma have all been reported. Benign and malignant growths as well as primary and secondary tumors have been seen.

The diagnosis is based on mediastinal distortion with concomitant symptoms, such as pain, dyspnea, cyanosis, or carotid edema. Roentgenograms usually reveal a pathognomonic configuration in the mediastinum.

The treatment is surgical with complete removal of the gland and the tumor and this may be followed with roentgenotherapy when malignancy is encountered. The complications that are sometimes seen following extirpation comprise the signs and symptoms of myasthenia gravis, leukosis, or severance of the phrenic nerve. *—Stephen A. Zieman, M.D.*

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

The Significance of Postoperative Pneumoperitoneum in Infants and Children. JOHN W. HOPE and HARRY R. CRAMER. *Radiology*, 1958, 71: 797.

HOPE AND CRAMER, of the Philadelphia Children's Hospital, obtained abdominal roentgenograms of children taken 24 hours after laparotomy. Most of the patients selected were chosen deliberately because the operative procedure had been complicated and lengthy, and frequently involved the removal of a large mass lesion.

The authors were greatly surprised to find no air in the peritoneal cavity in any of the infants and children 24 hours after the laparotomy. Eventually the postoperative examination consisted only of a film taken in the recovery room within 30 minutes after surgery. Nineteen infants and children, varying in age from 2 days to 8 years, were examined. In only 3 of the 19 patients examined was there any air present in the peritoneal cavity within 30 minutes postoperatively, and in each of these 3, the air was not visualized at 24 hours postoperatively.

Subsequently, the authors examined 12 infants and children who had a known quantity of air injected into the peritoneal cavity just prior to final closure of the peritoneum during herniorrhaphies. After 48 hours the air was gone from 9 of the 12 patients, and in the 3 others only a minimal trace of air remained. The oldest child studied was 8 years of age, but at what age an older child would show the usual adult pattern of retaining air in the peritoneal cavity for several days after a laparotomy is unknown. The authors conclude that any appreciable quantity of air in the peritoneal cavity of infants or children 24 hours after operation should arouse suspicion of a continuing leak, and a second laparotomy is probably indicated.

—Gilbert S. Campbell, M.D.

Marlex Mesh, A New Plastic Mesh for Replacing Tissue Defects. Experimental and Clinical Studies. FRANCIS C. USHER, JOHN P. GANNON, JOHN G. FRIES, JOHN L. OCHSNER, and L. L. D. TUTTLE, JR. *Arch. Surg.*, 1959, 78: 131, 138.

MARLEX is a new high density polyethylene with a higher softening temperature and greater tensile strength than conventional low density polyethylene. A softening temperature of 260 degrees F. permits this plastic to be sterilized in the autoclave without damage. Its tensile strength compares favorably with that of nylon, teflon, dacron, and silk. For the mesh a simple taffeta weave with a thread count of 42 by 40 per inch is used. It is necessary to heat seal the cut edges of the mesh.

In 31 dogs marlex mesh was used to replace large defects in the abdominal wall, chest wall, and diaphragm. At autopsy the mesh was found to be well infiltrated with pliable fibrous tissue. Moreover, on comparison with teflon fabric implanted as a control, a more uniform infiltration and better bondage of the marlex to the margins of the defect were observed. After 6 months there was no fragmentation of the marlex and no decrease in tensile strength. When infection was produced in these wounds there was no slough of the mesh or sinus formation.

In clinical studies marlex mesh has been used in 78 patients with various types of hernias or defects of the chest and abdominal wall. Forty-eight of the cases were incisional hernias for which three different techniques were used. Early in the series the mesh was used to reinforce an overlap type of repair. Later with simple closure of the defect, the mesh was sutured over the closure under moderate tension. In 7 cases in which the defect was large, the mesh was sutured in place as an "inner boot"; this appeared to have a greater mechanical advantage than when the graft was placed over the defect. To prevent the accumulation of serum, catheter-suction drainage was used in all of the incisional hernias.

In 23 patients with large direct inguinal hernias a strip of marlex mesh was used in the repair. After the floor of the inguinal canal had been repaired by one of the conventional methods the mesh was sutured to Poupart's ligament, the pubic tubercle, the rectus sheath, and the internal oblique muscle. In this group there were no instances of serum accumulation or wound infection.

Marlex mesh was used effectively to bridge the defect created when primary tumors of the ribs were excised in 4 patients. In a similar manner it was used when tumors of the anterior abdominal wall were excised in 3 patients.

Wound infections occurred in only 3 patients, all of whom had incisional hernias. In none of these was it necessary to remove the graft. All responded to open drainage and antibiotics.

—George R. Holswade, M.D.

Strangulated Femoral Hernia: A Review of 170 Cases. FRANK A. ROGERS. *Ann. Surg.*, 1959, 149: 9.

A STUDY was made of 170 cases of acute incarcerated femoral hernia from the College of Medical Evangelists Surgery Service at the Los Angeles County Hospital. There were 116 females and 54 males, 71 per cent of whom were in the age decades from 60 to 90 years.

The correct diagnosis was made in 80 per cent of the cases preoperatively. The diagnosis was made in another 31 cases, or 19 per cent, at surgery. Two cases were undiagnosed at death, representing 1 per cent. The mortality was 11.4 per cent among the patients diagnosed preoperatively and 13 per cent in the group diagnosed at surgery. A sharp increase in the mortality was noted when the proper diagnosis was delayed for more than 24 hours.

Since 1949 the retropubic (Cheatle-Henry) approach has been used. In 10 cases the surgical approach was femoral with no deaths, in 112 it was inguinal with 14 deaths, in the cases with the retropubic approach there were 4 deaths, in 10 with the

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right rectus approach there were no deaths, and in 7 cases with other approaches there were 2 deaths. The retropubic approach is superior to other methods because of the unusually good exposure of the femoral canal from above. It allows an excellent repair of the femoral defect and is far more advantageous in dealing with gangrenous bowel. It also allows exposure of the opposite femoral ring where a femoral defect exists in 20 per cent of the patients.

The contents of the hernial sac greatly influence the results of the surgical treatment. Several studies have shown a high mortality associated with incarcerated small bowel as compared with other incarcerated or strangulated viscera. In this study the presence of omentum with loops of small intestine in the sac did not significantly decrease the seriousness of the hernia. When omentum alone was strangulated, the mortality was low.

The clinical signs and symptoms are less dramatic and severe when the strangulation does not involve the bowel. The chief factors influencing the symptomatology and prognosis are the presence or absence of small bowel in the hernial sac and the presence or absence of gangrene. The combination of gangrene in a loop of small bowel is lethal.

The most difficult problem associated with the surgical treatment of the strangulated femoral hernia involves the proper recognition and treatment for gangrenous bowel. There were 35 small bowel resections with 9 deaths, a mortality of 26 per cent. Most of the anastomoses were done with end-to-end open two-layer suture techniques. There were no deaths from leaking anastomoses.

The mortality associated with release and repair of 160 hernias was 12 per cent.

Patients with no associated disease withstood the longer operating times with no significant increase in deaths, while among those with associated diseases the deaths increased manyfold.

There was a total of 42 postoperative complications in 37 cases. The wound infection incidence was 6.6 per cent, with 11 patients manifesting some degree of suppuration in operative incisions. The majority of the suppurations were noted in patients who had had excision of gangrenous small bowel.

—*Charles Baron, M.D.*

Inguinal and Femoral Hernioplasty, Results Following Bassini and McVay Repairs. BÖRGE CHRISTIANSEN and MAC FELLÄNDER. *Acta chir. scand.*, 1958, 115: 362.

AFTER REVIEWING the recent history of inguinal hernia repair and the anatomic factors involved in the two types of repair under discussion, the authors analyzed their recurrence rate during the period, 1951 to 1956.

There were 582 cases of inguinofemoral hernia in the group studied. The first-year recurrence rate was 3 per cent for the McVay-treated hernias and 13 per cent for the Bassini-treated type.

Although the follow-up period was as little as 2 years in a significant number of cases, the article is well written and represents a large experience and careful analysis of two widely used types of hernia repair. The authors present a convincing argument for the McVay operation. —*Richard E. Gardner, M.D.*

The Problem of Recurrent Incisional Hernia. AMOS R. KOONTZ, *Texas J. M.*, 1958, 54: 833.

FOLLOWING THE OPERATION for cure, incisional hernias, like inguinal hernias, recur entirely too frequently. The author stresses that there would be no problem of recurrent incisional hernia if there were no incisional hernia in the first place, as most of them could be prevented. In the prevention of incisional hernia the type of incision may be important, although a recent survey has shown that the percentage of hernias occurring in transverse and vertical incisions was approximately the same.

The author feels that the method of closure is probably more important than the type of incision. He believes that catgut should never be used except in the presence of infection because it has been demonstrated many times that catgut sutures are not reliable beyond a few days, and it is well known that it takes 10 to 14 days to get good healing in any wound. He believes the wound should be carefully closed in layers and his personal preference is for a continuous silk suture in the peritoneum because it eliminates small gaps in the peritoneal closure through which small tags of omentum may protrude if large interrupted sutures are used. The abdominal fascia should be closed by a true fascia-to-fascia closure and this cannot be done if areolar or adipose tissue is left on the fascia edges when they are sutured together. The author has discontinued the use of older types through-and-through stay sutures, but when the fascia shows evidence of weakness he sometimes uses buried far-and-near stay sutures through the fascia.

Incisional hernias sometimes occur even with the best of care. Postoperative distention, coughing, or vomiting may be important in their etiology, but the author believes that most incisional hernias are caused by sloppy closures of the abdominal wounds.

Once the hernia has occurred it should be repaired as soon as possible because it is generally easier to cure the condition in the early stages, but often difficult to cure it after it has been present a long time. In the case of large defects, the edges of which are difficult to approximate, relaxing incisions should be made in the fascia over the muscles adjacent to the defect whenever possible. If the muscle is good under the incisions one need not fear the occurrence of a hernia through the muscle. Far-and-near sutures through the fascia distribute the tension and affect a good and easy approximation of the fascia edges. Occasionally after the far-and-near sutures have been placed, the muscle under the relaxing incision separates as a result of tension. If the separation is in the upper abdomen, where there is a good posterior sheath of the rectus, little damage is done. However, in such instances the author generally places either a piece of tantalum mesh or a cutis graft under the muscle at the point of separation and this has proved to be a satisfactory procedure. In most incisional hernias the sac is not composed simply of peritoneum but of peritoneum reinforced by fibrous scar tissue. In many instances these flaps of reinforced peritoneum may be fashioned to close the defect. When the closure is weak for any reason, some reinforcing agents such as tantalum gauze, cutis grafts, or fascia transplants should be used. Preoperatively, pneumoperitoneum is an in-

valuable aid in permitting the replacement of extensive hernial contents. —*Wayne F. Cameron, M.D.*

GASTROINTESTINAL TRACT

A New Explanation of the Mechanism of Achalasia of the Cardia. L. Deloyers, R. Cordier, and A. Duprez. *Med. Press*, Lond., 1958, 240: 1227.

So-called cardiospasm is characterized by the progressive difficulties encountered by food in passing the cardia, although there is no anatomic stenosis to be demonstrated. The term "achalasia" was introduced in 1927 by Hurst who observed failure of the sphincteral segment to relax when it was reached by a peristaltic wave coming down the esophagus. In 1925 Rake noted evidence of degeneration of the myenteric ganglia in 10 cases of achalasia and provided the first anatomic support for the current theory of the pathogenesis of the disease.

Although it is known that achalasia is characterized by an organic agenesis or degeneration of the ganglion cells of Auerbach's plexus in the lower esophagus, it is still not known exactly how the neurologic lesions lead to a local stenosis.

The authors feel that achalasia of the cardia should be studied in the broader framework of all the digestive manifestations resulting from lack of Auerbach's ganglion cells, for histologic lesions of Auerbach's plexus similar to those found in achalasia have been demonstrated in megaduodenum, megajejunum, and megaileum. In all these conditions, whether in sphincteral or nonsphincteral areas, the same characteristics are demonstrated, namely, a local stenosis, an upper dilatation, and an absence of Auerbach's ganglion cells in the narrowed segment.

Working with cats the authors were able to reproduce cardiospasm by the injection of a 5 per cent phenol solution through a very thin needle into the wall of the cardia and lower esophagus. The phenol was colored with methylene blue and the injection was carefully introduced between the outer longitudinal and the inner circular coats of muscles. After operation the appetite of the animals decreased rapidly, and they lost weight. Roentgenograms of the animals revealed that transit of barium through the esophagus was definitely retarded, although there was still active peristaltic movement. The cardiac segment was found to be narrowed and the lower esophagus acquired a bulblike aspect, outlining an incipient megaesophagus. On sacrifice after 2 or 3 months the postmortem examination revealed no changes suggesting an extrinsic inflammatory stenosis of the cardia resulting from the diffusion of phenol. Sections of the cardia and lower esophagus were removed en bloc, and a severe stenosis of the cardia and a typical dilatation of the esophagus were revealed. The esophagus, cardia, and stomach were perfectly supple; there was no sign of fibrosis, esophagitis, or muscular hypertrophy. Histologic examination confirmed the absence of any organic stenosis due to a pathologic modification in one of the elements of the wall, and this is a prime reason for presupposing the existence of a neurogenic disturbance. Special stains showed definite and severe modifications of Auerbach's ganglion cells.

The authors have no histologic demonstration so far of any lesion of the nervous fibers of the area, but they believe they exist, and further investigations are in progress. They feel that further work will show microscopic evidence that denervation of sphincteral as well as nonsphincteral segments of the digestive tract results in the contraction of all circular fibers, supporting the theory of Hurst, who was the first to explain so-called cardiospasm by lack of relaxation of the cardiac circular smooth fibers.

—*Wayne F. Cameron, M.D.*

Incidence of Coronary Ischemia After Partial Gastrectomy. R. S. Walker, W. C. Watson, and J. K. Watt. *Brit. M. J.*, 1958, 2: 1438.

The authors, of Glasgow, Scotland, studied 40 patients, ranging from 7 to 13 years of age, after a Polya type of partial gastrectomy. A clinical history, physical examination, blood lipoprotein estimations, and electrocardiography before and after Master's two-step test were obtained on each patient. At the same time, 40 men in the same age group with long-standing symptoms of duodenal ulcer (mean duration 17 years) were also studied and, as a further control group, the authors examined 40 "normal" males without ulcer or cardiac symptoms and of a comparable mean age. The incidence of myocardial ischemia in the gastrectomy group (6 positive ECG's) was less than in the nonulcer control group (15 positive ECG's) and in the nonoperated upon ulcer group (21 positive ECG's).

These figures suggest that the cardiac status of the gastrectomy patient is better than that of his fellows. Because the gastrectomy group is much lighter than the other two groups, it seems possible that ischemia is related to weight. However, no correlation between absolute weight and ischemia was found in the ulcer and control groups. Weight loss by itself does not seem to be the main factor, and it is tempting to relate the lower incidence of coronary ischemia in gastrectomy patients to the diminished fat intake and impaired fat absorption which frequently occurs after a Polya gastrectomy. However, this has not been reflected in a significantly lowered blood lipoprotein level. The authors conclude that there is a significantly lower incidence of coronary ischemia in long-term gastrectomy patients compared with "ulcer" and "normal" controls, although no statistically sound explanation for such a difference was found.

—*Gilbert S. Campbell, M.D.*

Care of Patients After Total Gastrectomy (Magenlose Patienten und ihre Betreuung). H. Sauer. *Münch. med. Wschr.*, 1959, 9: 74.

The number of gastrectomies performed for cancer of the stomach has increased considerably in recent years while the operative risk has been markedly reduced. The operative mortality (1949 to 1957) at the author's hospital was 12 per cent, and the over-all cure rate was about 10 per cent, while nearly 50 per cent of the patients survived one year. The postoperative care has become increasingly important if death due to malnutrition rather than malignancy is to be avoided.

Reflux esophagitis is common, but usually not severe in the absence of hydrochloric acid of gastric origin. It frequently disappears in time as the jejunum

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takes over the storage function of the stomach. Esophagojejunitis occurs frequently and causes immediate postprandial discomfort probably because of the appearance of undigested food in the bowel. Stenosis of the anastomosis occurs because of technical difficulty or shrinkage of the scar, especially when the intake of solid food is delayed too long. Bougie dilatation may be necessary in such cases. Achylic diarrhea or diarrhea alternating with constipation is relatively frequent, probably because of the lack in synchronization between the rapid passage of food and normal or delayed secretion of digestive hormones. Enteritis and the loss of the vagal nerve may have contributing importance. The "dumping syndrome" is quite obviously related to vegetative disturbances. The early syndrome of nausea and collapse may be due to pooling of blood in the splanchnic area, and the late syndrome of hypoglycemia has been explained as a mechanical reaction of the islands of Langerhans.

Disturbances in the protein metabolism are the most important changes. It appears that certain amino acids cannot be metabolized, that pathologic protein breakdown products are increased, and much nitrogen is lost. The problem is further complicated when the pancreatic secretions are disturbed because of (a) the absence of reflex stimulation from the oral mucosa (via the vagus nerve) and (b) the asynchronism of the humoral phase (duodenum). Enteritis, as a frequent companion, inhibits proteolysis, certain enzymatic reactions, and thorough absorption. Organisms from the colon are present in the small bowel and there is danger of ascending infection into the biliary tree. Early proteolysis with its toxins damages the liver, and malignant metastases, if present, further increase hypoproteinemia. The laboratory discovery of early protein deficiency is very complicated, and once the body loses its ability to mask the deficiency, irreparable damage may be done.

The disturbance in carbohydrate metabolism is characterized by intolerance of sugar, milk, and starch which may be caused by the absence of alpha-amylase (from the duodenum only) and/or pancreatic insufficiency. The fat metabolism is interfered with by the loss of gastric lipase, insufficient utilization of pancreatic lipase, and poor or absent emulsion of neutral fats by the bile. Steatorrhea is therefore commonplace and there is a marked loss of fat, but fat is well tolerated and often craved. All the above factors combine to produce a so-called polyhypovitaminosis which may appear with the signs and symptoms of neuritis, petechiae, osteoporosis, and anemia. Iron deficiency anemia occurs in 10 per cent of the patients, even after good replacement or substitution therapy, within the first 2 to 3 months. The anemia may become macrocytic during the first 2 postoperative years unless B_{12} prophylaxis is instituted early, and megaloblastic anemia may develop if patients live that long. The author saw 2 cases resembling pernicious anemia in his series.

In the management of these disorders prescription of a multitude of drugs is unrealistic and unenforceable. Apart from the physician's psychological guidance and encouragement, the following points are most important: (1) good dental and prosthetic care, (2) avoidance of eating in the recumbent position to avoid reflux, (3) repeated small meals, (4) solid food at the beginning of a meal and liquids at the end, (5) the diet to be rich in fat and protein and low in carbohydrates, and (6) pancreatic and vitamin substitution therapy for at least 6 to 9 months.

—*W. Dieter Bergman, M.D.*

Favorable Postgastrectomy Results in Billroth II Patients with a Small Stoma. J. J. McCaughan, Jr. and Ralph F. Bowers. *Arch. Surg.*, 1958, 77: 837.

When one studies the postoperative Billroth II patients, the idea immediately occurs that the symptoms must be due to the loss of the pyloric sphincter and part of the stomach, which is usually associated with rapid emptying of the remainder. This sudden flow of food and fluid into the jejunum, then, must be prevented if the symptoms are to be overcome.

To test the validity of this concept, the authors set up a clinical experiment in which the deliberate formation of a small stoma was accomplished during the Billroth II operation. The purpose of the small size of the stoma was an attempt to slow up the gastric emptying. Roughly, 1.5 to 2.5 cm. has been the selected size of the small stoma, although this cannot be accurately measured. In this study, a stoma of 2.5 to 6 cm., or larger, is recognized as large. The authors have been able to measure some large stomata formed during the Polya type of gastrectomy and found the anastomoses to range from 4 to 6 cm. in diameter. The small stoma is measured by one finger by some operators, or a finger tip and a half by others, and this measures roughly 1.5 cm. Admittedly, this method is not scientifically accurate, but the use of the finger and thumb to measure gastrointestinal anastomoses is a part of a surgeon's trade; the method is employed daily and can be considered worthy of consideration. It is enough for the experienced surgeon, they believe, to state whether the stoma is small (1.5 cm., more or less) or large (3 to 8 cm.), and that these observations are sufficiently accurate to be meaningful.

This study compares the postgastrectomy results in 100 patients with small stomata and those in 100 patients with large stomata.

The cause of the postgastrectomy syndrome is closely related to rapid gastric emptying.

These studies reveal a definite reduction in the postgastrectomy syndrome in patients with a small stoma as compared to those with a large one.

—*Benjamin Goldman, M.D.*

Late Results of Treatment of Bleeding Gastroduodenal Ulcers (Das Spaetschicksal blutender Gastro-Duodenal-Ulzera). W. Behrends and N. Steinhardt. *Deut. med. Wschr.*, 1959, 84: 216.

The authors traced 134 patients who had been treated for massive gastric or duodenal hemorrhage during the years 1946 to 1956. Eighty-eight of these patients had been treated conservatively by medical means, and 46 had been treated by gastric resection. Fifty-seven of the patients bled a second time, 15 patients a third time, and one, a fourth time. Recurrence of bleeding was found exclusively in those patients who had been treated conservatively for a previous bleeding episode.

The history in 50 of the 88 patients treated conservatively suggested that their bleeding was from a chronic ulcer. In 38 patients, the ulcer was probably acute. Of the 50 patients with massive hemorrhage from a chronic ulcer for which they were treated conservatively 78 per cent bled again. Of the 38 patients with bleeding from an acute ulcer 47 per cent suffered recurrent bleeding after conservative therapy.

The following conclusions may be drawn from the results presented. The immediate treatment for a bleeding peptic ulcer should be conservative. If conservative methods fail, operation should be performed before the patient has gone into shock. If, according to the history, the bleeding is from an acute ulcer, conservative treatment alone may be successful and the ulcer may never bleed again. The bleeding chronic ulcer, on the other hand, will usually bleed massively again, and definitive surgery should be performed as soon as the patient has been brought to an optimal condition by medical treatment.

—*Elmer V. Dahl, M.D.*

The Surgical Treatment of Marginal Ulcer. JOHN M. BEAL. *Am. Surgeon*, 1959, 25: 1.

AFTER PRIMARY SURGERY for peptic ulceration 85 to 90 per cent of the patients are free of recurrence. A study of the failures should help to assess the initial therapy and preventable factors. Marginal ulceration was studied in a group of 204 patients seen during 25 years at the New York Hospital Cornell Medical Center. The average age of the group was 50.8 years and only 20 of the patients were women. Anastomotic ulceration followed gastrojejunostomy in 151 patients and partial gastrectomy in 53. The primary site had been in the duodenum in 149 patients, in the stomach in 7, in the pyloric canal in 1, and in an undetermined site in 47. Pain was the first manifestation of marginal ulceration in 72.2 per cent. The peak incidence of the occurrence was within one year after initial surgery, but ulceration developed in a significant number of patients more than 10 years after gastrojejunostomy. The treatment was as follows:

In the gastrojejunostomy group 44 of the patients were given conservative management, 2 patients were subjected to dismantling of the anastomosis with partial gastrectomy, 29 patients to dismantling of the anastomosis only (16 had resections later), 8 were subjected to vagotomy (3 had partial gastrectomy later), and 8 patients to miscellaneous procedures (revision, closure of fistula). In 19 of the 53 patients with initial gastrectomy the treatment was conservative, 14 had a higher resection with one postoperative death, 17 were subjected to vagotomy, and 3 to miscellaneous procedures. For the results of these procedures see Tables I and II. The results in these tables indicate the results which were found after the initial operative procedure that was employed in an effort to combat marginal ulceration.

These results demonstrate that definite hazards are connected with any mode of treatment. A total mortality of 12.1 per cent in the surgical group and 11.3 per cent in the conservative, (after gastrojejunostomy) was noted; however, only 9.1 per cent of the latter group remained without ulcer symptoms. In the gastrectomy group only 2 patients were free of ulcer

TABLE I.—TREATMENT OF MARGINAL ULCERATION WHICH FOLLOWED GASTROJEJUNOSTOMY

	Type of Therapy				
Result	*Conservative*	*Dismantling and resection*	*Dismantling Vagotomy*	*Vagotomy*	*Miscellaneous*
Well 5 years or more	3	31	0	3	1
Well less than 5 years	1	17	1	0	0
Recurrent ulcer	27	9	21	4	5
Deaths from ulcer	5	2	3	0	0
Deaths from other causes	8	1	0	0	0
Operative deaths	—	1	4	1	1
Lost to follow-up	0	1	0	0	1
Total	44	62	29	8	8

TABLE II.—TREATMENT OF MARGINAL ULCERATION WHICH FOLLOWED PARTIAL GASTRECTOMY

	Type of Therapy				
Result	*Conservative*	*Dismantling and resection*	*Vagotomy*	*Miscellaneous operations*	*Total*
Well 5 years or more	2	4	9	0	15
Well less than 5 years	9	3	4	0	16
Recurrent ulcer	7	5	2	1	15
Operative deaths	—	1	0	1	2
Deaths from ulcer	1	0	0	0	1
Deaths from other causes	0	1	2	1	4
Total	19	14	17	3	53

symptoms when treated conservatively. Of 34 surgically treated patients, 14 have remained free from symptoms for more than 5 years and 3 (8.3 per cent) died from operative intervention.

Several conclusions can be drawn from this study: (1) gastrojejunostomy is followed by a significantly high incidence of marginal ulceration, (2) the operative risk in secondary procedures is high, and (3) in a small group, standard forms of therapy were exhausted without cure. The best treatment for this disease is dismantling of the gastrojejunostomy and partial gastrectomy. Vagotomy is only rarely successful. After gastrectomy further resection may be necessary, which indicates that the initial resection was not extensive enough; usually vagotomy will offer the best results. Compromise procedures were notably unsuccessful. Consideration should be given to endocrine disturbances if ulceration persists after adequate therapy.

—*W. D. Bergman, M.D.*

Benign Tumors of the Stomach (I tumori benigni dello stomaco). U. VERONESI, R. PERUZZOTTI, A. ANTONELLI, and G. PELLEGRIS. *Tumori*, Milano, 1958, 44: 469.

OF 27 BENIGN TUMORS of the stomach observed by the authors, 17 were polyps. The remaining group consisted of 4 myomas, 3 neurilemmomas, 1 neurofibroma, 1 fibroma, and 1 glomus tumor. The symptoms in 15 cases appeared less than one year prior to the first examination, in 5 cases between 1 and 4 years, in 4 cases between 4 and 8 years, and in 3 cases longer than 8 years.

Pain was present in 78 per cent of the entire series, a sensation of heaviness over the epigastrium in 79 per cent, heartburn in 37 per cent, nausea in 29 per cent, loss of weight also in 29 per cent, vomiting in 22

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per cent, and melena in 15 per cent. Men formed 63 and women 37 per cent of the entire group.

The most frequent site of the benign tumors, not unlike that of carcinomas, was the antrum and the pylorus. This observation suggests the hypothesis that the same etiologic factors play a role in the genesis of both benign and malignant tumors.

From the histogenetic point of view benign tumors of the stomach may be divided into 4 groups: (1) epithelial, (2) mesenchymal, (3) nervous, and (4) those developing from heterotopic inclusions of the gastric wall.

The symptoms have no relation to the histologic structure of the tumor but depend on its size, the proximity of the pylorus, concomitant ulceration, or gastritis.

The most important complications are hemorrhage, malignant degeneration, and pyloric obstruction.

Roentgenologic studies and gastroscopy are essential for correct diagnosis. —*Joseph K. Narat, M.D.*

A Review of Glomus Tumors with Particular Consideration of Their Gastric Location (Considerazioni sui tumori glomici con particolare riguardo alla localizzazione gastrica). L. GENNARI. *Tumori*, Milano, 1958, 44: 524.

GLOMUS TUMORS are vasculonervous formations which develop with predilection in areas exposed to great variations of temperature or pressure. The most frequent sites are the coccygeal region, the matrix of the nails of hands and feet, the periosteum of the terminal phalanges of the hands, the skin overlying the thenar and hypothenar region of the hands, the plantar fascia, the skin and subcutaneous layer of the forearm and elbow, the "pulvinar of the acetabulum," the prostatic capsule, and the hard palate.

The dimensions of the formation range from 100 to 400 microns. Its main component is the afferent artery. The wall of the arteriovenous anastomosis consists of an endothelial layer, an elastica interna, a tunica media, and a tunica adventitia. The delicate reticulum in the external layer contains numerous amyelinic nerve fibers.

Normal glomus performs 3 functions: (1) regulation of blood pressure, (2) regulation of temperature, and (3) derivation of blood. In case of necessity, dilatation of the lumen of the anastomosis allows the blood to pass directly from arteries to veins, thus accelerating the circulation and reducing the danger of thrombi formation.

Glomus tumors occur with greatest frequency in the fourth and fifth decades of life. Their location in the stomach is exceedingly rare. Such formations show a slow or very slow evolution and remain small, not exceeding 4 cm. in diameter. Histologically, they must be differentiated from hemangiopericytomas. Clinically they are characterized by epigastric pain, gastric hemorrhage, or signs of an ulcer.

The author supplements 7 cases collected from the literature with one of his own. It concerns a female patient, aged 45, suffering for 4 months from anorexia, vomiting, and postprandial pain. The tumor was located in the antrum. Two years after gastroduodenal resection the patient was in perfect health.

—*Joseph K. Narat, M.D.*

First Studies of Measurement with a Swallowed Intestinal Transmitter (Der verschluckbare Intestinalsender und seine ersten Messergebnisse). H. B. SPRUNG. *Langenbecks Arch. Deut. Zsch. Chir.*, 1958, 289: 605.

BECAUSE OF the length and anatomical configuration of the major portion of the gastrointestinal tract, the small bowel and, to a certain degree, the colon are not accessible to clinical observation. When a small high-frequency transmitter, which was developed by the author and von Ardenne in 1956, is swallowed, it can give reliable information as to the pressure, *p*H, and temperature of an intestinal segment. The instrument is 26 by 8 to 10 mm. in size and contains a transistor transmitter with a single nickel-cadmium cell and a frequency of 1,500 kilocycles per second. The instrument is first warmed to body temperature and standardized for a base line. Consequent changes in pressure and temperature during its passage through the intestine will appear as changes in frequency and amplitude and can be picked up by a wire antenna wound around the body.

First experiments with the instrument have shown that the periods of increased pressure in the small bowel are multiphasic (3 to 8), occur every 3 to 20 minutes and last 3 to 12 seconds; the pressures vary between 20 and 60 cm. H_2O. The pressures in the cecum appear to be 2 to 3 times higher. The peristaltic wave in the colon is demonstrated by uniphasic pressure waves every 1 to 5 minutes which last 8 to 25 seconds. Pressures of up to 200 cm. H_2O have been measured in the ascending colon.

—*W. Dieter Bergman, M.D.*

Experimental Study of the Relationship Between Intestinal Carcinoids and Lesions of the Right Side of the Heart (Contributo sperimentale alla conoscenza dei rapporti esistenti tra carcinoidi intestinali e lesioni del cuore destro). C. STEGER. *Arch. ital. chir.*, 1958, 84: 202.

THE AUTHOR carried out an experimental study to determine if there was a relationship between the serotonin produced by carcinoids of the intestine (especially when associated with hepatic metastases) and lesions of the right side of the heart. Injections of 5-oxy-tryptamine (2.5 mgm. per day) were given to guinea pigs for various periods of time and then the hearts were studied for pathologic alterations. Definite lesions of the right side of the heart, such as edema of the pulmonic valve and infiltration of the cardiac muscle by inflammatory cells, were found after 60 days of administration of the drug.

—*Alexander J. Conte, M.D.*

Congenital Atresia of the Small Intestine. H. GLADNIKOFF. *Acta radiol.*, Stockh., 1958, Suppl. 164.

THE AUTHOR presents a survey of the literature concerning congenital atresia of the small bowel, and then presents 24 proved cases with extensive radiologic studies. The most frequent site of obstruction was the jejunum in 7 instances; the upper transverse part of duodenum was next in 6 cases, while the vertical part of the duodenum was the site in 5 instances. In 2 cases the lower transverse part of the duodenum was the level of the block whereas the obstruction was found in the ileum in 4 patients.

The atresia was incomplete in 5 of the children and in 3 cases a typical malrotation was found either at autopsy or at the operating table.

One of the early chapters in this extensive monograph is dedicated to the roentgen findings in normal newborn children. This serves as a useful contrast for the very excellent radiographic reproductions accompanying the case reports of these sick infants.

—Matthew H. Evoy, M.D.

Certain Problems Pertaining to the Diagnosis and Treatment of Closed Injuries of the Intestines. (Text in Russian). M. I. LANDA. *Khirurgia*, Moskva, 1958, p. 49.

OF 33 PATIENTS with closed injuries of the abdomen 19 had intestinal trauma, distributed as follows: duodenum, 3 cases, small intestines, 11, large intestines, 5.

Operations were performed under ether anesthesia in 8 cases, under local anesthesia in 9, and under combined anesthesia in one. In the remaining case no operation was performed because the condition was not recognized. Resection was done in 8 cases, suturing of the laceration of all intestinal layers in 5, suturing of torn mesentery in one, suturing of lacerated serosa in 2, and in 3 instances a flap of the serosa of the cecum, produced by the injury, was sewn back in place.

The greatest diagnostic difficulty was encountered in recognizing laceration of the mesentery, especially if it was not accompanied by a considerable hemorrhage. If, following a closed injury of the abdomen, no classical symptoms of trauma of a hollow viscus or a parenchymatous organ are present, a tear of the mesentery should be kept in mind.

If the patient has suffered a sharp blow against his lumbar region or the pelvis, as was the case in 7 patients observed by the author, the possibility of injury of the intestines should be considered.

An injury of the retroperitoneal portion of the duodenum may not be recognized even during exploration.

In the author's series no drains were inserted, with the exception of a very thin catheter for postoperative instillation of antibiotics.

The author is skeptical in regard to the value of enterostomy. Intravenous infusion of saline solution was supplemented by venoclysis of from 200 to 400 c.c. of 0.5 per cent procaine solution in 24 hrs. Plasma and blood transfusions were widely employed. The author also favors hypodermic injections of 1 c.c. of 1 per cent morphine solution every 5 hours and uses the intravenous administration of sodium bromide routinely.

Of 18 patients who were operated on, 16 recovered and 2 died. The deaths were due to a delayed diagnosis. *—Joseph Narat, M.D.*

The Rationale of Selective Surgery in the Treatment of Duodenal Ulcer. JOHN BRUCE, W. I. CARD, I. N. MARKS, and W. SIRCUS. *J. R. Coll. Surgeons Edinburgh*, 1959, 4: 85.

PATIENTS with duodenal ulcer have 84 per cent more parietal cells in the stomach than do individuals without peptic ulcer. The average acid output in duodenal ulcer patients is about 70 per cent more than in normal healthy subjects.

Of 169 males with duodenal ulcer, half secreted in the resting state more than double that secreted by normal subjects, and 1 in 8 secreted more than five times the quantity of resting secretion of normal subjects.

An investigation of 14 subjects with proved jejunal ulcer after partial gastrectomy for duodenal ulcer showed that the acid output of the gastric remnant was greater than that of a normal intact stomach, and only a little less than that found to be average for the intact stomach in cases of duodenal ulceration.

On the other hand, in 9 subjects in whom the recurrent ulcer was in the stomach or on the suture line, there was a low production of acids. Thus, recurrence of ulcer in these patients is associated with local nutritional or ischemic changes rather than hyperacidity.

If recurrent ulceration is to be avoided, operation for duodenal ulcer should be selected in the light of the secretory capacity of the gastric mucous membrane, it should, in fact, be "tailored" to the size of the parietal cell mass.

There is a group of duodenal ulcer subjects (11 per cent in the Edinburgh series) who secrete in the resting state as much acid as the normal subject will produce in response to histamine. Radical seven-eighths resection may be used in this group. The authors' policy is to supplement standard gastrectomy with vagotomy when the maximum output in one hour after histamine administration has been found to be 50 mEq. or more. Patients in whom the acid is not particularly high can be treated by standard gastrectomy, or by vagotomy combined with one of the more conservative procedures.

This policy of "tailored" gastric surgery is recommended to diminish the incidence of recurrence and avoid subjecting all duodenal ulcer patients to the same type of operation. *—Frederick W. Preston, M.D.*

Crohn's Disease. A. V. POLLOCK. *Brit. J. Surg.*, 1958, 46: 193.

IN THIS STUDY, the cases of 34 patients reported by Armitage and Wilson from Leeds in 1950 were reexamined and the series extended by the addition of all further cases of Crohn's disease admitted to the Leeds General Infirmary from 1950 to 1956. In all, 108 patients were included; 52 were followed up for more than 5 years, and 30 for more than 10 years.

The youngest patient was 4 years old and the oldest was 69 at the time of operation. Forty-eight of the patients were men and 60 were women. Only 3 were Jewish.

The grading of cases of Crohn's disease on a pathologic basis is unsatisfactory. Instead, it has been found useful, from the point of view of prognosis, to divide the patients into three groups based on the length of history: (1) acute Crohn's disease, with a history of less than one month, (2) subacute Crohn's disease, with a history of one month to 2 years, and (3) chronic Crohn's disease, with a history longer than 2 years.

One hundred and five of the total of 108 patients were treated surgically. In 46 the lesion was resected,

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in 13 it was bypassed, and in another 46 it was not treated, either an appendectomy or a simple laparotomy being done.

Of 52 patients followed up for more than 5 years, 17 had the acute form of the disease. Thirteen of these had no further trouble and are at present symptom free. In 4 disease persisted or recurred.

Eighteen patients with subacute Crohn's disease have been followed up for more than 5 years. In 14 the lesion was resected; in 4 it was let alone. There were more recurrences than in the acute group (4, or 22 per cent).

Seventeen patients with chronic Crohn's disease were followed up for more than 5 years. In this group, there was a high incidence of recurrence (11, or 65 per cent), regardless of whether the lesion was resected, bypassed, or let alone. Only 3 patients of this group are in perfect health.

In two-thirds of the recurrences, symptoms of recurrence commenced within a year of the operation.

Once the disease has recurred, it is unlikely to be brought under control permanently by medical or surgical means.

There is a relationship between Crohn's disease and ulcerative colitis. In 7 cases in the series, the diagnosis of ulcerative colitis was entertained at some time during the course of the disease.

When obstruction or fistula complicates the disease, operative treatment is indicated. In this series, there was nothing to indicate the superiority of resection in one or two stages, short-circuiting, or short-circuiting with exclusion of the diseased segment.

—*Frederick W. Preston, M.D.*

Lipomas of the Cecum with Ileocecal-Colic Intussusception (Les lipomes du caecum avec invagination iléo-caeco-colique). R. FONTAINE, P. FRANK, P. WARTER, M. KIM, and L. TUCHMANN. *Lyon chir.*, 1958, 54: 841.

THE AUTHORS report 3 cases of submucosal lipomas of the cecum that caused ileocolic intussusception and obstruction. In the first patient, a 61 year old male, a 6 cm. lipoma lay at the ileocecal valve, producing an irreducible ileocolic intussusception with obstruction of the small bowel. An ileotransverse colostomy was carried out, which was followed at a second stage by a right colectomy. The operative diagnosis was carcinoma. The second patient, 64 years old, presented a similar picture of crampy abdominal pains and bright blood in the stool. At operation an irreducible ileocolic intussusception necessitated a right colectomy. A 3 by 2 cm. lipoma lay across the ileocecal valve. The third patient, a 42 year old woman, had signs of intermittent intestinal obstruction and a left lower quadrant mass, resulting from an ileocolic intussusception. At operation a 7 cm. lipoma was found at the base of the cecum and removed by right colectomy.

From reviewing the literature the authors have found that lipomas of the colon are more frequent on the right side, that 90 per cent are submucosal and 10 per cent subserosal, and that symptoms depend on the location of the tumor. Intussusception appears to be a frequent complication of cecal lipomas, occurring in about one half of the reported cases.

—*John H. Wulsin, M.D.*

Oxyuris Infestation of the Appendix Simulating Symptoms of Appendicitis. MALCOLM L. BARNES and GEORGE PERRINE. *J. Kentucky M. Ass.*, 1958, 56: 1217.

THERE CONTINUES to be a considerable difference of opinion regarding the incidence of Oxyuris vermicularis infestation of the appendix and its possible role in the cause of acute appendicitis. From 1 to 11 per cent of surgical specimens of the appendix, when prepared by ordinary techniques, show oxyuris infestation. With special pathologic techniques the worms are discovered in as high as 33 per cent of the specimens.

The authors present a clinical pathologic analysis of 69 cases. The cases were essentially divided into three categories: (1) those with a preoperative diagnosis of acute appendicitis with normal findings, (2) those with a preoperative and pathologic diagnosis of acute appendicitis, and (3) those with a preoperative diagnosis of acute appendicitis and a pathologic diagnosis of oxyuris infestation. The symptomatology, the findings on physical examination, and the laboratory data for the three groups are compared. The clinical findings tabulated included anorexia, nausea, vomiting, right lower quadrant pain, constipation, diarrhea, previous attacks, localized tenderness, muscle spasm, and rectal tenderness. Although these findings were found in the highest percentage in the group with the preoperative and pathologic diagnosis of acute appendicitis, they were found in a very considerable proportion in the group with a pathologic diagnosis of oxyuris infestation, and to a lesser extent in the group without pathologic diagnosis.

These findings indicate that oxyuris infestation of the appendix can cause symptoms of appendicitis perhaps by acting as a foreign body and causing intra-appendical tension and muscular spasm. The weight of evidence signifies that when worms are present a diagnostic problem arises, and the available methods of diagnosing oxyuris infestation should be used in perhaps all but the cases having classical manifestations of acute appendicitis.

—*E. Thomas Boles, Jr., M.D.*

A Case of Amebic Granuloma of the Colon. (Text in Greek). P. CHRYSSOSPATHES and V. PAPATHEODOROU. *Acta chir. hellen.*, 1958, 5: 745.

THE OPINION is expressed in this article that amebiasis is dependent not on geographic factors but on the existence of unhealthy living conditions. It is also mentioned that amebic granuloma of the colon is a rare complication of the disease and that it can manifest itself as an appendiceal abscess, a cecal mass, an ulcerating lesion of the rectum resembling carcinoma, or as a mass encroaching the lumen of the colon, again resembling a neoplastic process. In another reported series, there were 18 cases of this complication in a total of 10,000 cases of amebiasis.

SUMMARY OF CASE REPORT: A 30 year old married woman had been treated intermittently for intestinal amebiasis for 2 years prior to admission. In November 1956, she had had bilateral upper abdominal pains and vomiting which subsided on antiamebic therapy. However, about every 3 to 4 weeks she continued to complain of upper abdominal pains. In July 1957,

she had a cholecystectomy for cholelithiasis and was subsequently discharged from the hospital on the thirteenth postoperative day. Twenty days after the cholecystectomy the patient was readmitted with an attack of pain in the right lower quadrant. She was treated conservatively and was benefited. The pain, however, recurred 10 days later and was accompanied by a fever of 38.2 degrees C. and a white cell count of 18,000. An exploratory operation was performed with the diagnosis of acute appendicitis. At operation a mildly inflamed appendix was removed, but another cause for the pronounced symptoms was sought. An orange-sized lesion of the hepatic flexure was found, greatly impinging on the lumen of the colon. A right hemicolectomy was done with ileotransverse colostomy. The patient recovered and was discharged from the hospital on the thirteenth postoperative day.

The removed specimen was a markedly inflamed, thickened, and edematous portion of the hepatic flexure of the colon, about 2 cm. in thickness. The mucosa of the involved colon was ulcerated and acutely and chronically inflamed. The lumen was markedly stenotic. Microscopic examination revealed granulomatous inflammation and many amebae. No neoplasia was found.

The authors recommend partial colectomy for this lesion for the following reasons: (1) because of inability to differentiate it from carcinoma, even at the operating table, and (2) because this should be the treatment of choice in hemorrhage and/or stenosis of the colon produced by amebic granuloma.

—Nicholas J. Demos, M.D.

Surgical Management of Diverticulitis of the Sigmoid Colon. S. E. O'Brien and K. I. Mustard. *Canad. M. Ass. J.*, 1959, 80: 257.

Sixty-four cases in which surgical treatment was given for diverticulitis of the sigmoid colon are reviewed. Most of the operations were for the complications of the disease. Frequently, the complications were of acute onset with few or no previous symptoms of diverticulitis.

One interesting feature of the study was the high incidence of incorrect preoperative diagnosis, particularly in patients with acute complications. In 10 cases the preoperative diagnosis was appendicitis and in 10 others it was carcinoma. It was also in error in 13 other cases.

The most common operative finding was a sigmoid mass (30 cases). Abscess and perforation occurred in 11 cases each. Fistula was present in 7 patients, obstruction in 5, and coexisting carcinoma in 4.

The operative procedure of choice is the elimination of the involved portion of bowel by resection. This was done in three stages in 18 patients, in one stage in 10, and in two stages in 2 patients. Mikulicz resection was done in 6 patients, an abdominoperineal resection in 2, and the Hartman resection was performed in one patient.

There were 6 postoperative deaths, a mortality of 9.5 per cent.

There is a trend in the treatment of the disease to perform one-stage sigmoid resection on patients with repeated bouts of uncomplicated diverticulitis. This operation can be performed without added risk, with much shorter periods in the hospital, and considerably less expense. It is recommended by the authors to forestall serious complications.

—Frederick W. Preston, M.D.

Results of the Surgical Treatment of Carcinoma of the Colon and the Rectum in the Period from 1946 to 1955 (Ergebnisse der Colin- und Rectum-carcinom-Chirurgie von 1946 to 1955). F. Kootz. *Chirurg*, 1959, 30: 10.

The material discussed consisted of 146 tumors of the colon and 256 of the rectum. These 2 groups were classified separately because of the dissimilarity in the proportion of surgical successes in the two groups, a difference which is ascribed mainly to the greater tendency of the cancers of the lower end of the large bowel to infiltrate the pararectal tissues and to produce metastases.

In addition, however, each of these groups was divided into subgroups. Those patients treated during the period from 1946 to 1950 were separated from those treated from 1951 to 1955. This secondary classification was developed to emphasize the differences in the result-percentages produced by the progress in surgical preparation of the patient and in the methods of anesthesia, surgical technique, and postoperative care.

Of the 146 cancers of the colon, 69 were observed during the first of the aforementioned 5 year periods and 77 during the second. About half of each of these subgroups was pronounced inoperable. During the first period the proportion of operations in 1 session, as against those in 2 or more sessions, was 21 to 14; during the second 5 years this proportion dropped to 32 to 7. The operative mortality during the first period was 32.4 per cent, during the second period it was 10 per cent. The improvement in the mortality rate is ascribed to surgical progress, but principally to the use, during the second period, of anti-infective agents (sulfonamides, antibiotics).

Of the 256 rectal cancers (134 in the period from 1946 to 1950; 122 in the period from 1951 to 1955) 65 were operated upon radically during the first 5 year period and 70 during the second. The proportion of those operated upon in 1 session, as against those operated upon in 2 sessions, was 10 to 46, during the first 5 years and dropped to 48 to 13 during the second. In the rectal cancers the operative mortality of 35.7 per cent during the first 5 years dropped to 8.5 per cent during the second.

On the whole, the author believes that irradiation of either colonic or rectal cancers is of no value; such therapy has been employed only exceptionally in this series. The same may be said for the chemotherapy of cancer in its present stage of development. The author, nevertheless, believes that the chemotherapy of cancer holds much promise for control of these tumors in the future.

The ultimate results which have been obtained in the author's material, and which are exhaustively discussed in the original text, are not too divergent from those reported by other leading clinics. The earliest possible diagnosis and immediate resort to surgery offer the best hope for the betterment of the ultimate results.

—John W. Brennan, M.D.

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LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

Clinical Evaluation of Some Tests of Hepatic Parenchymal Function (Esperienze cliniche su alcune prove di funzionalita epatica parenchimale). G. FACCHINI, A. GARAGNANI, and F. PEDRAZZI. *Arch. ital. mal. app. diger.*, 1958, 25: 162.

THE AUTHORS have attempted to compare with the more common flocculation tests of parenchymal damage the following tests: the galactose tolerance test, hippuric acid excretion, prothrombin time, V factor (accelerated globulin), and VII factor (proconvertin). These liver function tests were performed in 32 patients with acute hepatitis, cirrhosis, chronic cholecystitis, and postcholecystectomy syndrome. The authors conclude that the galactose tolerance test and the prothrombin time response to vitamin K are of prognostic value comparable to the more commonly used bromsulphalein and flocculation tests.

—*Alexander J. Conte, M.D.*

Certain Aspects of Hepatic Function in Patients with Hyperthyroidism or Nontoxic Goiter (Alcuni indici di funzionalità epatica in pazienti portatori di gozzo normo ed iperfunzionante). G. ANGRISANI, G. CURZIO, and S. MUSELLA. *Rass. internaz. clin. ter.*, 1958, 38: 1,065.

THE OBSERVATION has frequently been made that a disturbance of certain hepatic functions may occur in the course of pathologic processes in other organs which apparently have no connection with the liver either anatomically or physiologically. Interrelations between the liver and the thyroid gland have been the subject of numerous studies.

The thyroid hormone has an intensive glycogenolytic effect and increases the catabolism of carbohydrates. Its presence facilitates absorption of sugar by the duodenal mucosa. The liver stabilizes the blood sugar level either by storing or releasing glycogen. Some investigators observed the appearance of glycosuria in rabbits after the administration of thyroxin. Augmentation of hepatic glycogen follows thyroidectomy in dogs. Intensive postoperative hypoglycemia can be noticed after removal of the thyroid gland.

Contradicting reports concerning the effect of the thyroid gland on the liver in man may be found in the literature. Some authors noticed hyperglycemia in patients with Graves' disease, but others found normal blood sugar levels. Pathologic galactosuria after galactose tolerance tests was found in patients with hyperthyroidism. The increase of the intestinal absorption of sugar in such cases has been attributed to the stimulating effect of thyroxin on the phosphorylation of glucides in the intestinal mucosa.

Administration of thyroid extract produces hypolipemia and not infrequently also hypocholesterinemia. Conversely, hypothyroidism may be accompanied by hypercholesterinemia. This is probably due to the reduced capacity of the liver to metabolize and eliminate cholesterol.

Several authors noticed parallelism between hyperthyroidism and bromsulphalein retention by the liver.

Postmortem examinations of patients who succumbed to thyrotoxicosis revealed, in many instances, fatty degeneration, acute yellow atrophy of the liver, or hepatitis.

The authors performed liver function tests on 20 patients with thyroid disease, 12 of whom had hyperthyroidism and 8 nontoxic goiters. In addition to serologic tests, such as the Takata and van den Bergh tests, galactose tolerance and bromsulphalein retention tests and determinations of bilirubin and glycine were performed.

The results of the study confirmed the opinion that thyroid hyperfunction may exert an untoward effect on the liver. Thyroxin may display a toxic effect on the liver and may reduce its glycogen contents by lytic effect or by reduction of phosphorylation of glycogen within the intestinal mucosa. The authors emphasize the importance of liver function tests in patients with simple or toxic goiters.

—*Joseph K. Narat, M.D.*

Intrahepatic Capillary Pressure in Portal Hypertension (La pression capillaire intrahépatique dans les hypertensions portales). R. J. M. STAS, H. D'HEER, and A. L. FROEHLICH. *Acta gastroenter. belg.*, 1958, **21: 687.**

ON THE ASSUMPTION that the intrahepatic capillary pressure corresponds closely to the pressure in the hepatic vein, the authors measured it by introducing a catheter into the hepatic vein as far as it would go, via the antecubital vein, the superior vena cava, the right atrium, and the inferior vena cava.

The procedure was carried out in 23 patients.

In the controls (9 cases) the suprahepatic capillary pressure measured between 2 and 4 mm. Hg, corresponding to what are considered normal levels in the portal vein.

In 3 cases of right-sided cardiac decompensation, the pressure in the suprahepatic capillaries and the hepatic vein was equally elevated, without any gradient between the two.

In 9 cases of cirrhosis, the suprahepatic capillary pressure was markedly elevated, averaging 28.5 mm. Hg., with an average gradient of 16 mm. between the capillaries and the hepatic vein; there was a further gradient between the hepatic vein and the right atrium, ranging from 0 to 19 mm. Hg. (In the 3 cases in which this gradient was 0, there was no ascites).

In 2 cases of extrahepatic portal hypertension, the suprahepatic capillary pressure was 10 mm., whereas the portal pressure in these cases was 40 and 25 mm. Hg.

The authors account for the elevated suprahepatic capillary pressure in cirrhosis by the interference with the bed of sinusoids in the liver, which normally dissipates the arterial pressure; in cirrhosis, the arterial pressure is transmitted to the suprahepatic capillaries with much less "dampening."

—*L. S. Cherney, M.D.*

The Management of Civilian Liver Injuries. E. W. GRAHAME, *Lancet*, Lond., 1958, 2: 1295.

ALTHOUGH THE LIVER is the largest organ in the body and is relatively superficial over a wide area, it is sel-

dom injured. However, it has been estimated that a third of the patients with liver injuries die at the time of the accident, another third within 6 hours, and that only the remaining third are likely to survive. This high fatality rate has been attributed to (1) errors in diagnosis, (2) associated lesions, and (3) injudicious treatment. The author presents an account of 62 cases of suspected liver injury which were observed at the Middlesbrough General Hospital, Yorkshire, England, during the past 11 years.

Liver injuries fall into several types: These are (1) neonatal injuries, which generally occur in children who are overweight at birth; the hematoma is usually in the line of the lower costal margin and it ruptures earlier than a subcapsular splenic hematoma would; (2) penetrating injuries, such as stab wounds and gunshot wounds which may involve the liver, or (3) concussion, which varies in severity from superficial hematomas to major concussion with avulsion, disruption, or actual fragmentation of the viscus. In the neonatal type of injury the child, although often overweight, is usually healthy at birth. Within a few days it suddenly becomes pale and shows the sign of massive internal hemorrhage. The sudden onset of the condition and the appearance of the child is so characteristic that a diagnosis can be made with considerable confidence. Roentgenography in the vertical position shows the bowel floating upward on the blood. In the other types of liver injury there is no certain guide in diagnosis. The history of a blow to the upper right abdomen or to the lower thoracic region posteriorly should arouse the suspicion of a liver injury. When there is persistent pain over the liver, which is worse on respiration and movement, or when pain is referred to the right shoulder or the lower dorsal spine, liver injury should be suspected. Shock is absent in the less severe cases, especially after stabbing; the diagnosis may be missed until it is too late. Avulsion of a major portion of the liver, on the other hand, causes severe shock long before there is any other sign of abdominal hemorrhage. Roentgenograms may reveal a foreign body, air or fluid in the chest, concussion injury or collapse of the lung, a raised diaphragm from accumulation of blood beneath it, or the presence of gas if a hollow viscus has been ruptured. However, the author emphasizes that if one suspects that a patient has a major liver injury, roentgen examination at this stage is a waste of valuable time. Laparotomy according to some observers is the only safe method of diagnosis, and others believe that far less harm is done by unnecessary exploration of doubtful cases than is caused by waiting until the diagnosis is certain. In the author's view the treatment should depend upon the type of injury.

In the case of major damage and hemorrhage, transfusion is imperative without delay, as severe liver hemorrhages are among the most urgent surgical emergencies. The author recommends that a midline incision be made, as this can be extended to the right or left as necessary. The liver and spleen are first examined and the type of injury is determined. Foreign bodies or loose fragments of liver should be removed. If the left lobe is almost torn off it should be removed as in partial hepatectomy. Most vertical splits, however, are far from complete and should be sutured. The catgut suture should pass deep into the liver in order to obliterate the dead spaces. Edge-to-edge suturing is impossible in fragmentation injuries, but a fold of omentum may be pushed into the rent and sutured. Packing with gauze or various artificial sponges is thought by the author to be undesirable. General treatment of the major disruptions consists of quick transfusions, early operation, removal of blood from the abdomen, suturing of main branches of the portal vein, suture of the liver, and multiple drainage.

When the liver has been dealt with, it is essential to search for other damage. If the diaphragm has been torn the appropriate coronary ligaments can be divided so that the liver can be eased out of the way in order to facilitate repair. Postoperative blood transfusions should be continued until the estimated blood loss has been replaced. Observation for injury to the lungs, signs of lung collapse, or fluid in the chest is important. Aspiration of the chest may be required. Antibiotics should be used with discrimination.

Complications include bile peritonitis, which is common in severe injuries, but fortunately tends to clear up, and bile fistulas which tend to close spontaneously Infection may result in wound sepsis or in a subphrenic or intrahepatic abscess. Bile in the blood after trauma is rare but carries a high mortality. This may occur several months after the injury. Blood and bile accumulate in a cavity in the liver and eventually erupt into a bile channel and find their way into the bowel. The patient complains of upper abdominal or low posterior thoracic pain, gripping in character, followed by hematemesis or often copious melena. Jaundice is a feature of most of these cases. Many of these patients in the past have been operated on for peptic ulcer, cholecystitis, or pancreatitis. Proper treatment is to explore the cavity in the liver, clear out the clot, and introduce a large drainage tube.

—*Wayne F. Cameron, M.D.*

Venographic and Scintillographic Demonstration of Liver Metastases. C. G. HELANDER, L. JONSSON, L. G. LARSSON, A. LINDBOM, and P. ODMAN. *Acta radiol.*, Stockh., 1958, 50: 533.

MANY COMPOUNDS are concentrated in the liver, either in the hepatic cells or the reticuloendothelial cells. If the substance is labeled with a gamma-emitting isotope, its distribution may be studied by scanning with a scintillation counter.

For cannulation of the hepatic veins a hooked catheter with a wire guide was inserted percutaneously into the right femoral vein. It was passed into the right atrium, the wire withdrawn so that the hook was formed, and the catheter was withdrawn until the tip passed into one of the hepatic veins. The wire could be reinserted and the catheter pushed back into the atrium and the guide was again withdrawn. The catheter was turned and withdrawn again under fluoroscopic control and another hepatic vein cannulated. In one-half the series three different hepatic veins were cannulated, while in one-fifth of the series only one vein was successfully cannulated. In 2 of 25 patients no hepatic vein was successfully cannulated.

For examination 15 to 30 ml. of urografin (30 or 45 per cent) were injected manually at a rate of 5 to 8 ml. per second. In obese patients an image amplifier

was used to help delineate the structures and the catheter. At least three exposures were made in rapid sequence.

The liver scanning was carried out by means of an automatic scanning scintillation counter after the intravenous dose of 0.5 to 1.0 mc. of colloidal gold (Au^{198}).

Fifteen patients without liver metastases were studied, and in addition, 6 patients with probable metastases (palpable nodular liver and/or jaundice) and 2 patients with widespread cancer without clinical evidence of liver metastases.

Five of the 6 patients with clinical liver metastases showed confirming defects in the venographic studies. One of the 2 patients with suspected but not clinically verified liver metastases showed multiple liver metastases by venography. The other patient gave negative results.

Each of the 6 patients with clinical evidence of liver metastases had an abnormal scintillogram. In the 2 cases without clinically demonstrable metastases the liver scan was normal.

Both methods are of value in demonstrating liver metastases, but the scintillogram is the more simple of the two methods. The venographic method may be of value in the patient in whom the results of the scintillogram are equivocal.

—*John H. Davis, M.D.*

Emptying of the Human Gallbladder Under the Stimulus of Cholecystokinin. PAUL EDHOLM. *Acta radiol.*, Stockh., 1958, 50: 521.

CHOLECYSTOKININ, a hormone derived from the duodenal mucosa, causes the gallbladder to contract. This report contains the results of its use in the diagnosis of biliary disease. One hundred and two patients were studied, each of whom had a functioning gallbladder (32 had no demonstrable calculi and 70 had calculi).

Telepaque was used as the contrast medium and was given on two consecutive days, six tablets on the first day and nine on the second, by mouth. At the time of roentgen examination a film was taken and the cholecystokinin was then administered by intravenous drip (3 mgm. dissolved in 500 ml. of normal saline solution and administered over a period of approximately 20 minutes). Roentgenograms were taken at 10 seconds, one minute, 3 minutes, and then every 3 minutes for the duration of the drip. Two subsequent films were also obtained.

In general, about 50 per cent of the contrast material emptied from the gallbladder after the administration of cholecystokinin. In 2 patients it failed to empty; one patient had a calculus which probably obstructed the duct, while the other patient did not. Of the 70 patients with calculi (group 2) 32 had a stone which partially prevented the emptying. Calculi could be observed moving along with the contrast material until they entered and obstructed the cystic duct.

Forty-five of the 102 patients in this series had some discomfort after the cholecystokinin administration. This varied from "rumbling" in the stomach to pain in the right upper abdomen which resembled biliary colic.

The 6 to 9 minute roentgenograms showed optimum filling of the bile ducts. The common bile duct failed to fill in only 3 of the 102 cases. The hepatic duct failed to visualize in 25 cases examined in the horizontal position and in 11 cases examined in the head-down position.

In 47 of the 99 cases in which the common duct filled, the findings were not clear enough to distinguish calculi.

The degree of contrast would appear to depend upon the ability of the gallbladder to concentrate the contrast material. When this is satisfactory the roentgenograms obtained are superior to intravenous cholangiography. —*John H. Davis, M.D.*

Diagnostic Value of Intravenous Cholangiography During Acute Cholecystitis and Acute Pancreatitis. HENRY C. JOHNSON, JR., B. DONALD MINOR, JACK A. THOMPSON, and H. STEPHEN WEENS. *N. England J. M.*, 1959, 260: 158.

THE AUTHORS used iodipamide for emergency intravenous cholangiography in 23 patients with acute pancreatitis and 38 patients with acute cholecystitis.

Obstruction of the cystic duct is commonly accepted as the principal etiologic factor in the development of acute cholecystitis. Direct demonstration of this phenomenon is possible with intravenous cholangiography.

In the presence of acute cholecystitis, visualization of the biliary duct system (47 per cent of patients) was invariably associated with failure of gallbladder opacification.

This pattern of excretion in the acutely ill patient proved to be a reliable indication of the presence of cystic duct obstruction and acute cholecystitis. In no patient with acute pancreatitis or with a variety of other noncholecystic acute abdominal disorders was this pattern encountered.

In the presence of acute pancreatitis, opacification of the biliary duct system (65 per cent of patients) was invariably accompanied by gallbladder visualization. The presence of acute cholecystitis could thereby be reliably excluded as a diagnostic possibility in these patients.

Failure of opacification of both the duct system and the gallbladder was accorded no specific significance in the differential diagnosis. This finding was assumed to relate to transient impairment of the circulatory status or of the functional capacity of the liver at the time of cholangiography.

False-positive and false-negative cholangiographic diagnoses of obstruction of the cystic duct and acute cholecystitis were not encountered. This can be ascribed to the use of a delayed 4 hour roentgenogram when duct visualization was usually faint or delayed at the completion of the basic 2 hour study.

The practical clinical value of this procedure lies in the rapidity and safety with which precise diagnostic data may be obtained. In patients with acute symptoms in the upper abdomen that are suggestive of biliary tract or pancreatic disease, and whose clinical and laboratory findings are inconclusive, the intravenous cholangiogram will often prove to be the decisive factor in establishing a diagnosis.

—*Charles Baron, M.D.*

Behavior of Gastric Mucosa in Chronic Noncalculous Cholecystitis (Il comportamento della mucosa gastrica nelle colecistiti croniche alitiasiche). G. Labò, G. B. Cavassini, L. Barbara, and P. Vannini. *Arch. ital. mal. app. diger.*, 1959, 25: 327.

Pain in the epigastrium that is a sequel of cholecystopathy has no relation to the ingestion of food and differs in this respect from the discomfort caused by hyperchlorhydria or peptic ulcer. Furthermore, the variability and irregularity of its appearance are stressed by many authors.

Various theories of the pathogenesis of gastric symptoms in the course of cholecystopathy have been advanced. Reflex stimulation of gastric innervation, an ascending infection through the portal, canalicular, or lymphatic route, and the reflux of bile into the stomach are examples of such pathogenetic hypotheses.

Discrepancies in the findings of various workers induced the authors to undertake a systematic study of the behavior of gastric mucosa in patients with chronic, noncalculous cholecystopathy. The study comprised a clinical evaluation with special attention to the case history; roentgenograms of the stomach and duodenum; examination of the gastric secretion before and after the administration of histamine; biopsy obtained through a gastroscope; cholecystograms; electrophoretic, microscopic, and bacteriologic examination of the bile; and histologic studies of removed gallbladders.

In a series of 62 cases symptoms of dyspepsia were present in 75.7 per cent. In 54.7 per cent they were of hyposthenic type and in 21 per cent of hypersthenic character. Roentgenologic examinations revealed gastritis in 56.3 per cent. Hypochlorhydria or achlorhydria was present in 56.4 per cent and hyperchlorhydria in 21 per cent. In a group of 10 patients biopsies disclosed circumscribed gastritis. Duodenographic studies showed spastic conditions in 37 per cent and antiperistaltic dyskinesia with reflux of the contrast medium into the stomach in 16 per cent of the entire series of patients studied.

—*Joseph K. Narat, M.D.*

Endoscopy of the Biliary Tract. H. Wildegans. *Germ. M. Month.*, 1958, 3: 377.

The author describes a light and optical system in a French gauge catheter for direct vision of the extrahepatic biliary tree. The obvious shortcomings of operative cholangiography induced the author to develop biliary endoscopy. The distal section of the endoscope is not curved, but set at an angle of 60 degrees to the optical axis 7 cm. from the end. The eye piece is a focusing device.

Indications for endoscopy are the same as for choledochotomy. Cholangioscopy is considered valuable in the diagnosis of tumors of the common bile duct, of the papilla of Vater, and of the pancreas, as well as in chronic pancreatitis and pancreatic lithiasis. Recent acute necrotizing pancreatitis is considered a contraindication.

The common bile duct is opened as for choledochotomy, and continuous irrigation with water is maintained while the instrument is inserted in the direction of the duodenum and then toward the liver. A tangential view of the common bile duct is obtained which appears as a cylindrical tube in which the retroduodenal, pancreatic, and intraduodenal portions of the papilla progressively narrow medially like a funnel. The mucosa is reddish-yellow; the papilla may adopt many different shapes and may be transversely slit, stellate, or polygonal. The picture varies rapidly with peristaltic activity. Small stones are whirled around in the irrigating stream and their removal is usually easy. Impacted stones may also be seen and removed. Endoscopy is said to facilitate the differential diagnosis between stones and other causes of obstruction of the bile ducts and especially papillary stenosis. It demonstrates changes in the bile ducts difficult or impossible to diagnose by other tests, such as the presence of a lipoma, diverticulum, or carcinoma.

The author has performed operative biliary tract endoscopy in 151 cases reported in this paper and in an additional 50 patients examined since completion of the manuscript. He denies awareness of any complications. Cholangiography and endoscopy are considered complementary. Endoscopy facilitates the interpretation of cholangiograms. In addition, biliary tract endoscopy gives better information concerning the shape and position of the bile ducts, the state of the mucosa, the presence of secretions and extravasations, the existence of inflammatory, ulcerative, or neoplastic changes, the position, number, and nature of stones, the condition of the papilla, and the nature and degree of stenosis or dilatation of the whole biliary tract extending deeply into the liver.

—*Allan D. Callow, M.D.*

The Common Bile Duct: Significance of Its Diameter. Deward O. Ferris and James C. Vibert. *Ann. Surg.*, 1959, 149: 249.

The diameters of the common bile duct of 98 patients, without stones or any other obstruction, ranged from 4 to 17 mm., the average diameter being 8.85 mm. In the 11 cases in which stones were present in this duct, the diameter ranged from 7 to 17 mm. The average diameter was 10.90 mm., or approximately 2 mm. larger than the average diameter of the ducts without stones. As evidenced by operative cholangiograms, none of the ducts was completely obstructed, as contrast medium freely entered the duodenum. However, evidence that the ducts were partially or intermittently obstructed was supported in some cases by the presence or history of obstructive jaundice. The presence or degree of jaundice did not have a direct relationship to the diameter of the common bile duct.

None of the bile ducts in the series was normal, because all of the patients had pathologic changes somewhere in the biliary tract. From a practical point of view, these are the bile ducts with which the surgeon is confronted and which he has to evaluate. Some bile ducts not containing stones were as large as any that did contain stones. Of 11 common bile ducts which contained stones, 8 were not large (between 7 and 11 mm. in diameter). It is therefore obvious that the diameter alone is not a reliable sign as to whether or not the common bile duct contains stones.

—*Charles Baron, M.D.*

Postoperative Stenosis of the Common Hepatic Duct Resulting from an Abnormal Artery (Sténose post-opératoire de la voie biliaire principale par artère anormale). PIER LUIGI TRIVELLINI and GIUSEPPE NIERI. *J. chir.*, Par., 1958, 76: 682.

THIS IS a detailed case report of a patient who had a cholecystectomy for cholelithiasis, and in whom stenosis of the common hepatic duct subsequently developed. Reoperation was performed and a Y-type anastomosis between the hepatic duct and the jejunum was successfully performed.

A 54 year old woman was admitted to the hospital in June 1957 with a diagnosis of chronic cholecystitis with cholelithiasis. A retrograde cholecystectomy was done without difficulty. At operation, the cystic artery was found to derive from the left hepatic artery, crossing the hepatic duct anteriorly. This anatomically abnormal artery was dissected out and ligated. The common duct and the rest of the biliary tree were normal.

On the third postoperative day the patient had an elevated temperature and pain in the right upper quadrant. A subphrenic abscess was suspected, but this was not demonstrated on the roentgenogram. On the sixth postoperative day the patient became jaundiced. In the meantime, the wound had healed by primary intention and the stitches were removed on the twelfth postoperative day. By the sixteenth day the patient's temperature had returned to normal. Jaundice was still present one month after the operation, and laboratory findings were typical of those of obstructive jaundice. Re-exploration was contemplated, but the patient refused and left the hospital in July.

She was readmitted at the end of September, at which time she agreed to further surgery because of a persistent and deepening jaundice.

At operation, a rigid adhesive band was observed that bridged the common hepatic duct at the site of ligation of the anomalous artery, completely compressing the underlying duct. When the adhesion was relieved, the hepatic duct did not expand as the walls were apparently adherent. It was impossible to determine whether the band was entirely a remnant of the cystic artery or a combination of this with a newly-formed adhesion. The stenosed portion was then excised, and the proximal end of the duct was anastomosed to the jejunum.

Postoperative recovery was uneventful, and the patient was discharged symptom-free within a month. A cholangiogram 4 months later revealed a good passage, and a barium meal showed no regurgitation into the hepatic duct. —*Peter Beaconsfield, M.D.*

Sphincterotomy and Papilloplasty; Indication, Technique, and Results in Chronic Pancreatitis (Sphincterotomie und Papillenplastik; Indication, Technik, und Ergebnisse bei chronischer Pankreatitis). A. FRITSCH. *Langenbecks Arch. klin. Chir.* 1958, 290: 146.

TRANSDUODENAL INCISION of the ampulla of Vater and the common duct was first performed by McBurney in 1891 and is now recommended by many surgeons for the treatment of benign papillar stenosis. Archibald in 1913 made chronic recurrent pancreatitis a further indication for this operation, arguing that dysfunction of the sphincter of Oddi and spasm causes reflux of bile into the pancreatic ducts, and so triggers recurrent attacks. Papillar stenosis in these cases is considered the cause rather than the result of chronic pancreatitis. The obstruction can be visualized fairly well by pancreaticography, but the definite diagnosis of papillar stenosis is usually not made until operative cholangiography is obtained. Stones, wedged in the papilla, and organic stenosis or hypertonic dysfunction, as diagnosed by serial films and/or manometry, are the usual indications for transduodenal exploration. In the author's series of 46 cases of this procedure for chronic pancreatitis, the diagnosis had been made in 20 cases, suspected in another 12 cases, and cholelithiasis only was expected in 14 patients before laparotomy.

The procedure includes wide mobilization of the anterior duodenum to make it more accessible, and a 2 cm. vertical incision into the duodenum. The papilla can then be visualized and brought out through the opening. In papilloplasty the anterior wall of the papilla is split for a distance of 1 to 1.5 cm. into the common duct, and a wedge of duodenal mucosa is excised. After probing of the pancreatic duct closure of the common duct and duodenal mucosa is undertaken, and the opening thus obtained usually permits passage of the largest sound. In the author's cases a simple sphincterotomy was done 6 times (now abandoned), papilloplasty 40 times, and external choledochoduodenostomy added in 15 instances. T-tube drainage was done in 12 of these cases, but has recently been avoided and is probably unnecessary.

There were no complications in 44 cases. One patient had a severe postoperative hemorrhage, and another patient died of diabetic coma. The results have been very satisfactory. Of 36 patients available for follow-up 30 are free of complaints, 4 have mild digestive disturbances without pain, and 2 had a recurrence of symptoms. —*W. Dieter Bergman, M.D.*

Acute Pancreatitis. A. V. POLLOCK. *Brit. M. J.*, 1959, 1: 6.

THE AUTHOR analyzed a series of 100 patients admitted to the General Infirmary at Leeds, England, in whom a diagnosis of acute pancreatitis had been definitely established. Of the 100 patients, 71 were female and 29 male. In half the men and three-quarters of the women, the gallbladder was abnormal. In most cases the abnormality was the presence of cholecystitis with stones. There was no association with alcoholic excess in any of his patients.

Although the exact cause of acute pancreatitis has not as yet been established, the author concludes that ductal obstruction with or without biliary regurgitation plays the major part in causing most cases of acute pancreatitis. In rare instances, acute pancreatitis can be caused by traumatic rupture of the pancreas and pancreatic carcinoma.

Generally, the onset of acute pancreatitis is explosive with the liberation of activated trypsin, lipase, and amylase into the blood stream, peritoneal cavity, and the retroperitoneal tissues. The presence of active pancreatic enzymes in the peritoneum and retroperitoneal tissues produces tissue necrosis and hemorrhage, and fat necrosis. Occlusion of the foramen of

Winslow may allow the development of a pseudopancreatic cyst. Occasionally, the enzymes may extend upward, and 3 patients in this series at autopsy had lesions above the diaphragm which were probably the result of pancreatic enzyme activity. Should the enzymes move downward, necrosis, hemorrhage, and fat necrosis can be present in the right iliac fossa.

An attack of acute pancreatitis is usually accompanied by the sudden onset of severe constant abdominal pain which radiates through to the back and is accompanied by frequent vomiting. This was present in all but 16 of the patients in the series. In about half of the patients, the classical picture of acute pancreatitis was present, and these patients showed pallor, sweating, cyanosis, low blood pressure, oliguria, and abdominal tenderness and rigidity.

Nineteen of the patients in this series had an abnormal electrocardiogram showing a decreased voltage of the T waves, sometimes inversion of T, and occasionally depression of ST during the course of the disease.

Fifty-six of the patients were correctly diagnosed by the clinical picture and estimation of the serum amylase.

In 36 patients the serum calcium levels were determined during the acute attack and 6 of these levels were below normal. These 6 patients developed clinical tetany and all of them died, despite massive intravenous administration of calcium in the form of calcium gluconate.

Twenty-six of the patients in this series died, and the author believes that the severity of the attack and the resistance of the patient contributed more to the final outcome than the type of treatment employed.

Customarily, patients with acute pancreatitis are treated with penicillin or other antibiotics, and 70 patients in this series were so treated. The results on the whole, however, were disappointing. Although the incidence of septic complications was lower, many of the patients still died of uncontrollable metabolic and electrolyte disturbances. Blood or plasma used early and generously is obviously advantageous. It is generally accepted that immediate operation in patients with pancreatitis can do no good and that elective surgery should await the subsidence of the acute attack. Conversely, diagnostic laparotomy has not been shown to do any harm, and in any doubtful case it is preferable to make sure of the diagnosis by laparotomy rather than miss another condition simulating pancreatitis and associated perhaps with an elevated serum amylase level.

The author believes that if a mass becomes palpable, exploration and drainage should be delayed since some masses will resolve spontaneously and external drainage of a recent pseudopancreatic cyst may lead to a pancreatic fistula with accompanying loss of electrolytes and protein. It is preferable to wait 6 to 8 weeks before operating on a pseudopancreatic cyst, as this delay allows for walling-off of the cyst. The author favors the transgastric anastomosis of the anterior cyst wall to the posterior stomach wall.

In the present series cholecystectomy has not been found to protect the patient against attacks of pancreatitis, and 4 patients in this series have had recurrent attacks of pancreatitis after cholecystectomy. Five patients with recurrent acute pancreatitis have had transduodenal sphincterotomy and 4 have remained well for 6 to 18 months. However, the great majority of patients who recover from an attack of pancreatitis suffer very few aftereffects, and recurrent pancreatitis is a rare disease. —*James H. Holman, M.D.*

Hypocalcemia and the Diagnosis of Acute Pancreatitis. RAGNHILD E. LILLJEKVIST. *Acta chir. scand.*, 1958, 115: 433.

SURGICAL INTERVENTION is avoided in patients with acute pancreatitis when the diagnosis can be made. Since hypocalcemia is known to occur in patients with acute pancreatic necrosis, the possibility of using this as a test for pancreatic disease is evaluated.

Studies of the serum calcium in patients with acute pancreatic necrosis verify the hypocalcemia, and the amounts lost have actually been measured in cases coming to postmortem examination. The amount of calcium in and around the pancreas in 6 patients who died varied from 600 to 1,732 mgm.

The present study was designed to evaluate the blood calcium in acute disturbances of the biliary and pancreatic tracts and to determine the extent of hypocalcemia in acute pancreatic necrosis. The serum calcium was determined by the method of Kramer and Tisdall with 9.0 mgm./100 ml. accepted as the lowest normal value. Diastase tests were considered abnormal with values above 256. Ninety-seven patients were studied.

The author concludes that acute pancreatic necrosis can lower the serum calcium to less than 9.0 mgm./100 ml. serum. The hypocalcemia is directly proportional to the degree of necrosis and is not seen in other cases of pancreatitis. It is therefore a better index of necrosis than is the diastase activity. Calcium should be administered in large quantities parenterally in cases of acute pancreatic necrosis.

—*John H. Davis, M.D.*

Wounds of the Pancreas, With Reference to 4 Cases (Les plaies du pancréas, a propos de quatre cas). P. LACHARTRE. *Presse méd.*, 1958, 66: 1910.

THE FIRST PATIENT sustained in addition to other serious wounds a bullet hole through the head of the pancreas. The wound was juxtaduodenal; it bled little and showed only a few ecchymotic spots. The pancreas was detached from the duodenum to determine if there was a concomitant injury to the bile ducts. The wound in the pancreas was sutured, the other injuries were repaired, and the abdomen closed with infrahepatic drainage.

Convalescence was uneventful; gastric aspiration was stopped on the third postoperative day. The bowels moved on the fifth day, and on the seventh the patient had resumed normal alimentation, was up and about, and seemed to have recovered.

On the eighth postoperative day, abdominal pain suddenly occurred, accompanied by manifestations of severe shock. At reoperation, 2 hours later, numerous areas of fat necrosis were present and the pancreas itself was found reduced to a serosanguineous mass of brownish color and friable consistency. Death occurred 3 hours after the second intervention.

In the second patient a bullet had perforated the

head of the pancreas in much the same manner as in the previous case. The pancreas was infiltrated by an extensive hematoma which did not appear to be increasing. The pancreatic wound was sutured, and the other wounds repaired. The patient died 10 hours after the operation. Again there was a total necrosis of the pancreas, but in this instance the spleen and left kidney had been removed and death could not be ascribed only to the pancreatic involvement.

The third patient sustained in addition to other injuries a bullet wound through the pancreas at the junction of the tail and body. The pancreas was partially resected; the removed portion included the caudal portion and the small section of the body which contained the bullet wound. The exposed duct of Wirsung was ligated, and the raw surface covered with omentum. A drain was inserted through a counter incision in the splenic region. Recovery was uneventful and the patient was discharged on the twentieth postoperative day, completely healed.

The fourth patient had sustained a bullet wound through the caudal portion of the pancreas with extensive laceration. The pancreas was partially resected and the duct of Wirsung ligated. The raw surface left by the resection was covered with omentum. The spleen was removed and the splenic area drained through a counter incision. The patient left the hospital on the fortieth postoperative day in excellent physical condition.

The author's experiences and his study of the literature indicate that in the presence of a wound of the body of the pancreas partial pancreatectomy is the treatment of choice. In wounds of the head of the pancreas external drainage for the pancreatic secretion should be attempted or, if this is impossible, some form of internal drainage should be sought.

Attention is directed to the gravity of leakage of bile for the bile activates the fat-necrotizing properties of the pancreatic juice.

—*John W. Brennan, M.D.*

Experiences of Radical Pancreatic Surgery in Cases of Carcinoma of the Head of the Pancreas or the Papilla of Vater. ERIK MILLBOURN. *Acta chir. scand.*, 1958, 116: 1.

THE AUTHOR has reviewed briefly the historical aspects of radical pancreatic surgery and presented his personal experience with 15 patients, 14 of whom had a malignant lesion in the head of the pancreas, and one in the papilla of Vater. The operative mortality in the author's series was 20 per cent. Of the entire group, only 2 patients remain alive, one 2.5 years and the other 39 months after radical surgery. As of September, 1958, the average survival time in this particular group of patients was 23 months.

The author emphasizes that radical surgery provides the only chance of survival for patients with carcinoma of the head of the pancreas. He employed pancreaticoduodenal resection only in certain patients with carcinoma of the papilla of Vater. Local excision was employed in the management of carcinoma of the papilla of Vater in 4 of 5 instances in which this diagnosis was made. He indicated that local excision through a duodenotomy incision is simpler and less extensive, but adds that it is not suitable in all cases of cancer of the papillary region. The author does not define the conditions under which local excision would be indicated in preference to the radical operation. Of the 4 patients in whom this type of resection was performed (none of which was included in this series) 3 are alive, but the follow-up has been very brief. The 4 patients ranged in age between 62 and 83 years.

In the performance of radical pancreaticoduodenectomy, the author prefers to preserve the distal portion of the pancreas and to anastomose the cut surface end-to-side with the posterior aspect of the stomach. Total pancreatectomy is to be avoided if possible. The author performs the operation generally in two stages: an end-to-side cholecystojejunostomy with a proximal enteroenterostomy in the first stage, and a pancreaticoduodenal resection followed by a pancreaticogastrostomy, and choledochojejunostomy and gastrojejunostomy in the second stage. The gastrojejunostomy is placed distal to the other anastomoses on the efferent loop. No attempt is made to "take down" the cholecystojejunostomy constructed during the first stage.

In cases of carcinoma in the papillary region, the author recommends that a biopsy specimen be removed during the first stage through an anterior duodenotomy incision. In carcinoma of the head of the pancreas, however, excision biopsy is performed with considerable danger; moreover, a satisfactory specimen is not readily obtained. Often it is the findings on palpation at the operating table which determine whether or not radical surgery will be performed. Errors in judgment in this particular area are inevitable. A particular mass in the head of the pancreas may be regarded as nonmalignant and the postoperative course may reveal that the mass was in fact a cancer. In another instance, a benign tumor may, on gross examination at the operating table, be considered malignant and influence the surgeon into the performance of radical surgery when, in truth, the microscopic examination may later reveal no evidence of malignancy.

There has been a considerable amount of literature published in the last few years which would discourage the performance of radical pancreatic surgery for carcinoma. The author deprecates this viewpoint and recommends strongly that surgeons continue to offer this operation to patients with carcinoma of the head of the pancreas and to selected patients with carcinoma of the papilla of Vater.

—*Harvey N. Lippman, M.D.*

Pancreaticogastrostomy in Pancreaticoduodenal Resection for Carcinoma of the Head of the Pancreas or the Papilla of Vater. ERIK MILLBOURN. *Acta chir. scand.*, 1958, 116: 12.

IN THE PAST 10 YEARS the author performed 15 radical pancreaticoduodenal resections for carcinoma of the head of the pancreas or carcinoma of the papilla of Vater. In 7 of the 15 cases (details of which are reported elsewhere) pancreaticointestinal continuity was re-established by a pancreaticogastrostomy rather than the usual pancreaticojejunostomy. The author states that this is the first time such a procedure was done in man.

The author firmly supports the concept of preserving the distal end of the pancreas and re-establishing continuity with the intestinal tract. He takes strong exception to the principle of simply ligating or closing over the distal stump of the pancreas.

According to the author's technique, the pancreaticogastrostomy is accomplished by anastomosing the entire cut end of the pancreas with the posterior wall of the stomach. No attempt is made to carry out a mucosa-to-mucosa anastomosis between the end of the pancreatic duct and the mucosa of the stomach wall, a point which has been emphasized by other authors. The actual anastomosis is accomplished in two layers. A piece of omentum is secured to the pancreaticogastrostomy and the area is carefully drained.

The author reports no immediate postoperative problems which might be attributed to this method of re-constituting the pancreatic and intestinal tracts. He describes neither leakage of pancreatic juice nor fistula formation in any of the 7 cases treated in this manner. He stresses the point that such an anastomosis permits repeated postoperative investigation of the excretory function of the pancreas and the patency of the anastomosis by studying the gastric juice. Amylase and trypsin activity was demonstrated postoperatively in all of his patients and as long as 3.5 years after operation in some cases. In one instance in which the pancreaticogastrostomy was obliterated approximately 2 years after the original operation, re-exploration was done and a new anastomosis was successfully performed between the pancreatic duct and the stomach. It is suggested that emptying the pancreatic juices into the stomach may play an important role in the prevention of stomal ulcer.

—*Harvey N. Lippman, M.D.*

Statistical Review Concerning 122 Cases of Pancreatic Neoplasms (Considerazioni statistiche su 122 casi di neoplasie pancreatiche). LUIGI ROTELLI. *Arch. ital. mal. app. diger.*, 1959, 25: 314.

IN A SERIES OF 15,000 postmortem examinations the author found 122 reports of primary malignant neoplasm of the exocrine portion of the pancreas. Benign tumors, sarcomas, and tumors deriving from the endocrine portion of the organ are not included in this review. The group consisted of 72 men and 50 women, mostly in the fifth, sixth, and seventh decade of life. The youngest was a 33 year old woman and the oldest also a female, aged 87. A correct diagnosis or suspicion of a pancreatic tumor in vivo was recorded in only 26 cases. In 73 patients a lesion of the liver, extrahepatic biliary ducts, stomach, or duodenum, and in 23 patients a pathologic process of other organs was suspected.

The head of the pancreas was affected in 61.4 per cent of the series, the body in 7.3 per cent, and the tail in 11.4 per cent, whereas in the remaining cases various combinations of the aforementioned sites were encountered.

Peripancreatic lymph glands were invaded in 55 patients, those in the hepatic hilus in 16, and the glands along the lumbar aorta in 10. Metastases in the liver were detected in 70 patients. Metastases were also found in the visceral and parietal peritoneum, pleura, lungs, stomach, duodenum, spleen, kidneys, heart, bones, and other organs. Whereas the common duct was obstructed in a large number of patients with a tumor of the head of the pancreas, the pancreatic duct was rarely involved. Ascites, recorded in only 17 patients, was due to compression of the portal vein. Cachexia in patients with pancreatic tumors is usually more pronounced than in patients with tumors in other organs of the digestive tract. This is due to anatomic and physiologic factors.

Obstruction of the common duct was caused by compression rather than by infiltration.

The scirrhus was the most frequent tumor.

—*Joseph K. Narat, M.D.*

MISCELLANEOUS

On the Etiology of Pseudomyxoma Peritonaei ex Appendicitide. EVERT E. SCHILDT. *Acta Soc. med. Upsaliensis*, 1958, 63: 160.

PSEUDOMYXOMA PERITONAEI may originate in the ovary or in the appendix. The present article is concerned with the latter alternative. Three theories have been advanced to explain the cause of the condition as resulting from the appendix. The first postulates that the cells of pseudomyxoma emanate from the appendicular mucosa. According to this theory an important step is the formation of a mucocele in connection with a basal stenosis after an attack of appendicitis. The mucosal secretion accumulates in the occluded appendix under increasing pressure and subsequently ruptures through the hypertrophic appendical wall. Epithelial cells are then thought to shed into the peritoneal cavity, which subsequently implant and continue to grow. According to a second theory, pseudomyxoma is a myxomatous degeneration of the peritoneum, and according to a third view, the disease is thought to be of inflammatory origin in the form of a foreign body reaction. Some investigators have thought that pseudomyxoma peritonaei is due to cystocarcinoma of the appendix.

The author presents a case of pseudomyxoma peritonaei which he believes favors the implantation theory. In the single case which he reports a 45 year old nulliparous female was operated upon for fibromyoma of the uterus. There was no antecedent history of appendicitis. At the time of operation the appendix was found to measure 2.5 inches in length and its free end was the thickness of a thumb and very firm, and a gelatinous whitish-gray mass the size of a fingertip was attached by a thin pedicle near the distal portion of the appendix. This material appeared to have been expressed from the appendix. A longitudinal section of the appendix revealed a stricture about an inch from the base, beyond which the lumen appeared to be obliterated.

The author concluded that the mucous mass was the result of a previous stricture of the base of the appendix with the formation of a mucocele and subsequent early rupture. The author agrees that although the specimen showed no patent communication, and there were no true epithelial cells outside of the appendix, this case probably illustrates one of the first stages in the development of the disease.

—*Wayne F. Cameron, M.D.*

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Pneumoperitoneum as an Aid to Diagnosis. A. F. Golwalla, M. S. Warawadekar, P. D. Anjaria, and M. R. Mody. *J. Postgrad. M.*, Bombay, 1958, 4: 189.

Although it has been in use for 40 years, pneumoperitoneum as a diagnostic technique has not received the attention and application that it merits. The method of inducing pneumoperitoneum is simple. Eight hundred to 1,000 ml. of air are introduced through an 18 or 20 gauge needle placed through the abdominal wall. In patients with ascites, as much fluid as possible should be removed prior to introduction of the air. The gastrointestinal tract should be free from gas when the roentgenograms of the abdomen are made, and to achieve this, patients are given an adequate dose of castor oil the night preceding the roentgen studies. Enemas or colonic irrigations are avoided. Roentgenograms of the abdomen are taken in the supine, prone, and erect positions at the end of the expiratory phase of breathing. Care is taken to include the domes of the diaphragm, and when necessary two films are taken to include the area beginning at the diaphragm and covering the entire pelvis.

Induction of pneumoperitoneum is a relatively safe procedure. The contraindications are (1) presence of congestive cardiac failure, (2) possibility of bowel adherent to the parietal peritoneum at the site of puncture, (3) presence of an active intraperitoneal inflammatory process, and (4) an associated systemic infection. Although a wide variety of complications has been described, they are for the most part of no serious significance. Among the potentially dangerous complications are puncture of the viscera, effusion into the peritoneal cavity, air embolism, mediastinal emphysema, and spontaneous pneumothorax.

The clinical conditions in which pneumoperitoneum has been utilized as an effective diagnostic aid include abnormalities of the liver and spleen, subdiaphragmatic lesions, and evaluation of the pelvic organs. The authors state that in the child, adolescent, or virgin adult in whom a pelvic examination may be inadequate or impractical, pneumoperitoneum can be of special value. Case reports with illustrative examples of the use of pneumoperitoneum in malignant conditions of the liver, portal cirrhosis, a variety of abdominal lumps, the detection of ascites, and suspected diaphragmatic hernias are included.

—*E. Thomas Boles, Jr., M.D.*

Nonpenetrating Injuries of the Abdomen (Les traumatismes non pénétrants de l'abdomen). L. Deloyers. *Acta orthop. belg.*, 1958, 24: 97.

In traffic accidents, the commonest injuries are those affecting the extremities, the thorax, and the cranium. Nevertheless, 30 per cent of the injuries are nonpenetrating wounds of the abdomen, either alone or in combination with the aforementioned injuries. Because of the often obvious external injuries, the nonpenetrating injuries to the abdomen are often neglected. This oversight frequently results in the death of the patient. It is essential, therefore, that the abdomen be examined carefully and at regular intervals after any traffic accident to confirm the absence or presence of any resulting injury.

The first step in the treatment of the accident victim is to combat shock. While this is being done, careful examination and laboratory tests should be carried out to determine the type and extent of abdominal injury. If surgery is indicated, this should be done as soon as the patient's general condition permits. According to the author's experience, if more than two of the vital abdominal organs are injured, mortality approximates 80 per cent.

In order for mortality from traffic accidents to be reduced, the author appeals for the formation of special emergency ambulance teams trained and equipped to deal with traffic accidents only. It should be possible for medical personnel to institute immediate measures, even preliminary surgery when necessary, either at the site of accident, or en route to the hospital. Secondly, the author suggests that certain hospitals be especially designed to incorporate surgical units which would handle traffic accident cases at any time. These hospitals should be located along the main arterial routes and, if possible, be placed at suitable intervals.

—*Peter Beaconsfield, M.D.*

GYNECOLOGY

UTERUS

Prolapse of the Uterus and Vagina. A Review of 539 Cases. S. SVENNERUD. *Acta obst. gyn. scand.*, 1958, 37: 416.

THIS ARTICLE is another in the series of painstaking reviews one finds regularly in the Scandinavian literature. It is an analysis of 539 cases of uterine prolapse operated on at Malmö General Hospital, Malmö, Sweden, between 1940 and 1950 and reviewed a minimum of 4 years later. Surgical treatment was almost completely confined to the Manchester operation, which was done as strictly defined in 437 cases. In 84 cases, either the cervix was not amputated or the levators were not sutured to each other, and this is referred to as the incomplete Manchester operation. In 16 cases the vaginal obliteration of LeFort was done.

The review compares the results in patients receiving complete and incomplete Manchester operations, and also in those who had late and early ambulation postoperatively. There were 7 deaths in the series, an incidence of 1.3 per cent, but only one occurred among the 163 patients treated by early ambulation, and all the statistics for morbidity and mortality were worse for the patients who had either the incomplete operation or delayed ambulation.

The most important feature of the article is a careful follow-up on the long term results of treatment. There were recurrences in 7.3 per cent of the original herniations, but many of these occurred in the group of patients on whom incomplete operation was performed. The author also notes 10 patients with persistent urinary incontinence among 49 who complained of incontinence before operation, and 20 additional patients with incontinence after operation.

The development of carcinoma subsequently in these patients is most interesting. Only one had carcinoma of the cervix. There were 3 with ovarian carcinoma, 4 with breast carcinoma, and 14 with gastrointestinal cancer. The author makes the point that the incidence of carcinoma of the uterus is so low that it cannot be used to support the argument that vaginal hysterectomy should be done in preference to the Manchester operation. —*Howard Ulfelder, M.D.*

Concentration of Malignant Cells from Vaginal Washings by Means of a New Type of Centrifuge. S. RASTGELDI and I. TURANLI. *Acta obst. gyn. scand.*, 1958, 37: 393.

THE AUTHORS describe a technique of continuous centrifugation which permits the removal of cells from large quantities of fluid with a distribution which tends to separate the epithelial cells from the blood cells and from the cellular fragments, mucus, and other debris. The centrifuge used is described in detail with clear illustrative diagrams, and there are good photomicrographs to illustrate the results.

The point is made that all present methods of cytologic diagnosis fail to some extent to reveal early carcinoma of the cervix, particularly carcinoma in situ, and the authors point out that one of the deficiencies stems from the fact that only a small percentage of the material available for examination is subjected to the techniques now in use. They recommend lavage of the vagina with 500 c.c. of normal saline solution and collection of the debris by means of a funnel. This fluid is put through the continuous differential centrifuge and thus the majority of epithelial and malignant cells present can be concentrated in a small enough section of the appliance to permit easy preparation of smears.

This device appears to offer an ingenious solution to the problem of finding malignant cells in clinical conditions in which they are few in number. The technique should certainly be given serious consideration whenever the method of collection is applicable.
—*Howard Ulfelder, M.D.*

Irradiation Sensitivity of Cervix Cancer. NORMAN F. MILLER, PETER P. LUDOVICI, ROBERT T. CHRISTIAN, and GARDNER M. RILEY. *Am. J. Obst.*, 1958, 76: 1071.

THE AUTHORS state that whereas chemotherapy may in the future become an important weapon in the treatment of cervical cancer, today irradiation remains our best weapon with some help from surgery. Considerable work has been done in irradiation therapy, much of it by trial and error in an attempt to standardize treatment. Since the proclaimed end point of therapy is the destruction of the neoplasm, treatment has in fact been determined by the effect on normal tissue. Cancers vary in their resistance to irradiation; some of them take less amounts than normal tissue and others more before they are destroyed.

The authors believe that if we could evaluate the tumors with regard to their resistance to irradiation we could do a better job. Grading by cytologic methods based on the evaluation of benign vaginal cells may be helpful in determining the irradiation responsive patient, according to Ruth Graham. Glücksmann reported a quantitative histologic method of assessing the irradiation responsiveness of cervical carcinoma by using serial biopsies. A persistence of mitotic activity and no alteration in the number of differentiating cells forbode a poor result. Spear and his collaborators showed the feasibility of using tissue cultures to evaluate tumor response to irradiation and more recently Lasnitzki showed similar results of small doses of irradiation whether in vivo or in vitro. This article is a report of a new in vitro approach.

Pre-irradiation biopsy specimens of tumor tissue were prepared by a method described in detail by the authors. After preparation, these tissue cultures were exposed to the same irradiation experienced by the patient by putting them in special capsules in the vagina. X-ray and cobalt units were used and the dosage and the field measured and standardized.

In evaluating the irradiation effects, the response of cultured cells to irradiation was determined by daily cytologic observations with the use of 2.5x and 10x objectives and recorded by means of 35 mm. photography. The criterion selected for the end point of the irradiation effect was the destruction of all outgrowing tumor cells. Because some cultures ceased growing after partial irradiation only to manifest regrowth some weeks later, all cultures received full irradiation and were maintained for at least a month after all growth had ceased.

In their results the authors described in great detail the characteristics of growth in the roller tube method. In most cases, unless great delay was experienced in the tissue growth, the exposure to irradiation was given between the fifth and seventh day, by which time most of the tissue explants had well-established outgrowths. In the delayed growth series only the pelvic phantom method could be compared because the treatment of the patient had already been done.

Of the in situ series, in only 10 of the 25 patients studied were conditions thought to be completely satisfactory for study; 8 had squamous-cell and one adenocarcinoma of the cervix. The other had a carcinoma of the vagina. The authors state that there are definite differences in in vitro irradiation sensitivity of these tumor cells, but that a correct mathematical formula which would permit a grading of these differences cannot yet be developed. They believe that when the 5 year survival rates for these patients are available, it may be possible to formulate an equation which will permit a positive correlation between the in vitro tissue sensitivity and the in vivo therapeutic response. In the meantime the following tentative method is proposed to compare results. The formula $E=\frac{r \times S}{1{,}000}$ is used in which E is the tissue culture radiation effect index, r the lethal or total roentgen dose, and S the number of days the culture survived subsequent to the first day of irradiation. For example, if the cultured cells received a total of 1,000 roentgens and survived 75 days then $E=\frac{1{,}000 \times 75}{1{,}000}$ or $E=75$. The authors have tentatively assumed that values 0 to 49 represent irradiation sensitive tumors; 50 to 99 represent tumors with intermediate irradiation sensitivity; and 100 or over represent relatively irradiation-resistant cancers. In their series of 10 cases the authors classified 3 as resistant, one as intermediate, and 6 as irradiation sensitive. The nonirradiated control cultures of the 3 resistant, one intermediate, and 6 sensitive cases averaged, respectively, 16, 20, and 13 days longer survival than their irradiated counterparts. One of the patients with a resistant cancer died in 5 months; one showed recurrence in 9 months. Seven patients showed a clinically satisfactory course ranging from 6 to 21 months.

Of the pelvic phantom series 9 were squamous-cell carcinomas and 5 were adenocarcinomas. In the former the authors also noted a difference in the in vitro irradiation sensitivity. According to their method of classification 5 were resistant, one was intermediate, and 3 irradiation sensitive. The nonirradiated control culture of the resistant, intermediate, and sensitive squamous-cell groups averaged 11, 38, and 16 days longer survival than the corresponding irradiated cultures. They think this control culture would have survived longer if it were not for the proliferation of fibroblastic elements which eventually overgrew and destroyed the tumor cells. In the irradiated series this was not a serious problem since irradiation was effective in slowing down the growth of fibroblasts to a point of their noninterference with the tumor cells.

Of the 5 adenocarcinomas, 2 were intermediate and 3 irradiation sensitive. They found no irradiation-resistant adenocarcinomas but think their series too small to be evaluated at this time.

The authors comment that, as might be expected, the phantom technique has many advantages. The success of the growth of the tumor explants depends on the number of explants per tube. They recognize this to be a complex problem and such things as extent or stage of disease and host resistance must be considered. This study was a preliminary attempt to more properly evaluate the relative irradiation sensitivity of patients' cultured cells.

—*Byford F. Heskett, M.D.*

Results in the Treatment of Collum Carcinoma at the Helsinki University Women's Clinic During the Years 1941 to 1952 (Ueber die Ergebnisse bei der Behandlung von Kollumkarzinom in der Universitaetsfrauenklinik zu Helsinki in den Jahren 1941–1952). Toivo Putkinen and Viljo Turtola. *Ann. chir. gyn. fenn.*, 1958, 47: 160.

A group of 1,195 cases of collum carcinoma has been observed during a period of 12 years ending in October 1952. Of these patients 44 were referred to other clinics, 42 were treated with palliative doses only, and 37 patients were lost to follow-up and are not included in the report. Of the remaining 1,072 patients 27 per cent had stage I carcinoma, 41 per cent stage II, 26.6 per cent stage III, and 5 per cent stage IV, with a gratifying increase in the percentage of earlier stages as compared to a previous report from the same institution. Stage 0 cancer was not routinely diagnosed during the observation period. Some early cases in which surgical treatment was employed are included.

The majority of patients received radium treatment. Early in the series it was administered by the Stockholm method, most frequently with a colpostat in the vaginal vault (Kahanpää). Since 1951 the intracervical radium has been replaced by the application of cobalt (Co^{60}), and the total radiation given was approximately 8,000 milligram hours, of which 3,000 were cervical and 5,000 vaginal. After three radium applications, each 2 weeks apart, external radiation was started to an optimum of 3,000 roentgens to the parametrium. With this treatment the following 5 year survival figures were obtained: 183 patients with stage I carcinoma, 65 per cent survival; 407 with stage II, 43.5 per cent; 281 with stage III, 28.1 per cent; and 58 with stage IV, 6.9 per cent. There were 929 patients in all with 40.8 per cent survival. This figure compares with a total relative cure rate of 42 per cent in Kottmeier's material (Stockholm, 1954). The figures have greatly improved during the past quarter of a century probably because of earlier discovery and patient alertness rather than better treatment.

Primary surgical treatment (Wertheim) with postoperative radiation was selected for 143 patients of whom 106 had stage I carcinoma. In this group 69.2 per cent of the patients and 78 per cent of those with stage I carcinoma were alive after 5 years. The small number does not permit statistical conclusions, but the authors are in favor of surgery in certain cases of early invasive cancer. Comparison of annual figures has shown a steady improvement in the over-all cure rates. —*W. Dieter Bergman, M.D.*

The Diagnosis of Endometrial Adenoma (El diagnostico de los adenomas del endematrio). GUILLERMO DI PAOLA, LEONCIO A. ARRIGHI, and ROBERTO NICHOLSON. *Obst. gin. lat. amer.*, 1958, 16: 313.

THE DIAGNOSIS of endometrial adenomas is of practical importance; the fundamental problem, however, is in differential diagnosis. The latter may mean the difference between a major surgical procedure and the simpler process of removing topically a benign lesion such as an endometrial adenoma. In a group of 378 patients, 137 had adenomas, whereas 241 patients had some complicating associated pathologic process which made the diagnosis difficult or prevented a reliable diagnosis from being made.

In a considerable number of patients there are no subjective symptoms and in most instances the diagnosis must be presumptive. Metrorrhagia or bleeding in a menopausal patient may be the significant finding. The diagnosis, however, can be certain only when the adenoma is in the cervical canal, since a uterine polyp, carcinoma, or functional disturbance may present the same symptom-complex.

The authors regard the exploration of the uterus with a polyp forceps as of considerable more advantage than curettage and emphasis is placed on radiologic examination. The shape and appearance of a defect in the uterine cavity will specifically aid in a differential diagnosis. Not only adenomas may be discovered by this method but associated conditions may also be revealed, such as myometria, hyperplasia, polyps, endometriosis, and carcinoma. It was stated, however, that small or medium-sized adenomas may not give a hysterographic image, under which circumstances curettement should be resorted to in order that a diagnosis may be obtained.

—*Stephen A. Zieman, M.D.*

ADNEXAL AND PERIUTERINE CONDITIONS

Ovarian Cystomas. DOMINIC A. DE SANTO, WELDON K. BULLOCK, and FREDERICK J. MOORE. *Arch. Surg.*, 1959, 78: 98.

IN THIS ARTICLE the authors have extended a previous study on ovarian cystomas seen in a large municipal hospital by adding the data from a large private hospital.

In part 1, an analysis is made of the cases limited to serous and mucinous cystic tumors in Caucasian women, a total of 533 cases. It is demonstrated statistically that in these tumors cancer increases with age, bilaterality increases with age (either benign or malignant), and cancer increases with bilaterality. Malignant disease was very rare in patients under 25 years of age and although there were almost three times as many serous as mucinous tumors, the tendency toward malignant change and to bilaterality was not statistically different in the two groups.

In part 2 the authors emphasize with pathologic evidence their contention that adenoacanthomas, clear cell carcinomas, and the mesonephromas of Schiller are usually traceable to serous cystadenocarcinoma of the ovary. —*Howard Ulfelder, M.D.*

Concerning Thyroid Tumors of the Ovary (A propos des variétés, de l'avenir, du diagnostic des tumeurs thyroidiennes de l'ovaire). P. BROCQ, C. ROUVILLOIS, and J. GAUCHEZ. *Presse méd.*, 1959, 67: 165.

THE AUTHORS discuss two unpublished observations (Rouvillois, Robert), previously published French observations (Fruhling, of Strasbourg, Tailhefer, of Paris, and Mazingarbe, of Montargis), and also a study of the 233 cases found in a review of the world literature.

This important material permits a study of the varieties and the diagnosis of thyroid tumors of the ovary. The most common are those in which the thyroid tissue is histologically normal.

Of the 233 tumors, 108 were in association with multicentric teratoid tumors. In 56 cases the thyroid tumor was an inclusion in the wall of a simple teratoid tumor. In 69 cases the tumor was an ovarian goiter, containing exclusively thyroid tissue. Tumors such as these may be hyperfunctional and may lead to symptoms of hyperthyroidism. Rarely are they cancerous. Of the 233 studied, 8 were malignant. The preoperative diagnosis is rarely made. Radioactive iodine may be of some use in the appraisal of the amounts of tissue contained therein. —*Donald R. Dye, M.D.*

Rare Case of Ovarian Arrhenoblastoma with Teratomatous Aspects and Zones of Endometriosis (Raro caso di arrenoblastoma ovarico con aspetti teratomatosi e zone di endometriosi). S. STEFANELLI. *Ann. ostet. gin.*, 1958, 80: 275.

THE AUTHOR has described a case of ovarian arrhenoblastoma in a 17 year old girl. She had an appendectomy at the age of 11. The menarche was at 12 years and her menstrual periods were regular until she was 16. At 16, for 3 months, she had a period every 15 days. She was given 5 mgm. of "testoviron" 5 times by her physician. This treatment was followed by 9 months of amenorrhea. Meanwhile, virilism occurred.

Physical examination in the hospital revealed general virilism, a hypertrophied clitoris, a normal uterus, an orange-sized, painless, elastic, mobile tumor on the left side. The results of pertinent laboratory tests were as follows: azotemia 0.35 gm., glycemia 0.82 gm., total neutral 17-ketosteroids 24.1 mgm. per 24 hours. A left ovariectomy was performed. The patient left the hospital 10 days after the operation.

In various parts of the tumor the tissues ranged from the most immature, typically sarcomatous form to that of the so-called testicular Pick's adenoma. Teratomatous characteristics were indicated by glandular zones covered with mucous cells of pseudomucin epithelium. Endometrial fragments were found near the surface of the tumor.

The author observed the girl 1 month and 8 months after the operation. The virile characteristics, except

for her bass voice, had regressed successively. Her period became normal. —*George Sillo, M.D.*

EXTERNAL GENITALIA

Vascularized Vulvovaginal Tumors (Tumori vascolari vulvo-vaginali) R. Bianco and S. Samuel. *Tumori*, Milano, 1958, 44: 510.

Six cases of vulvovaginal vascular neoplasm were selected by the authors from 8,014 hospitalized patients. The following types of tumors were included: 3 hemangiomas, 1 fibroangioma, 1 angiokeratoma, and 1 lymphangioma. Histologic observations showed the coexistence of a vascular and nervous tumor (i.e., hemangioma and neurilemmoma).

The first case was that of a 25 year old woman who had had one delivery by cesarean section for vaginal stenosis. The diagnosis was dysontogenetic hemangioma. She was treated with radium application per vaginum and roentgen castration. The tumor recurred 3 years later and the patient died.

A recurrent hemangioma after operation and irradiation was found in a 26 year old secundipara. The tumor was diagnosed after 2 months of pregnancy and treatment was prolonged until after delivery.

In case 3 a combined neurilemmoma and cavernous angioma was removed in a 71 year old multipara.

A biopsy was performed on a 32 year old nullipara. When a fibroangiomatous ulcerated polyp was found, no treatment was given. In case 5 an angiokeratoma was removed in a 64 year old multipara.

The last case was that of a 50 year old nullipara who had had a subtotal hysterectomy 20 years previously. Seventeen years after operation the patient was given radium and irradiation for cancer of the stump. Biopsy revealed lymphangioma of the vulva. The patient was treated by fulguration. —*George Sillo, M.D.*

MISCELLANEOUS

Pelviarteriography in the Diagnosis of Certain Chorioepitheliomas (L'utilité de l'artériographie du petit-bassin dans les chorio-épithéliomes de diagnostic difficile). Ulf Borell, Ingmar Fernstrom, and Axel Westman. *Gyn. prat.*, 1958, 9: 401.

The authors have used pelviarteriography in several cases in which the diagnosis was difficult to establish by current methods. Their technique makes use of the known presence of arteriovenous fistulas in certain hydatid moles and chorioepitheliomas. A polyethylene catheter is inserted into the femoral artery and passed upward to a point just beyond the bifurcation of the aorta. Contrast dye is injected and a series of pelvic roentgenograms made.

Three case reports are presented and the roentgenologic and subsequent operative and pathologic findings are described. The authors believe that the procedure is of the greatest value in the differential diagnosis of residual molar tissue or a new pregnancy when one is confronted with a lingering or rising chorionic gonadotropin titer. The procedure probably has the greatest value in the management of young women since the very nature of their age makes for prolonged and often harmful procrastination.

In the 3 cases reported, pelviarteriography led to the possibility of being able to rapidly perform the required radical surgery.

The article is very interesting and well written and the technique is adequately described. The conclusions seem to be based on sound roentgenographic principles and the procedure should add to our ability to diagnose such tumors more rapidly and with more accuracy than in previous years.

—*Donald R. Dye, M.D.*

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Serial Studies of Renal Function During Pregnancy and the Puerperium in Normal Women. ETHAN A. H. SIMS and KERMIT E. KRANTZ. *J. Clin. Invest.*, 1958, 37: 1764.

SERIAL STUDIES of renal function were performed on 12 pregnant women; 9 nonpregnant women served as controls. The studies ranged in time from 8 weeks of pregnancy to varying periods in the puerperium. The function tests used included para-aminohippurate clearance, inulin clearance, creatinine clearance, and the appropriate blood levels of creatinine and urea nitrogen.

In general, all the values for the pregnant patients deviated from those of the controls although not in a similar manner. The importance of serial studies was emphasized when it was noted that all patients showed some depression of values on the initial determinations. Renal plasma flow was noted to be elevated by the fifteenth week of pregnancy and remained elevated through the twenty-fourth week of pregnancy. From this point on, however, the renal plasma flow returned to normal range and during the postpartum period was found to be below normal for a variable number of weeks. The increased renal blood flow calculated from the hematocrit shows a similar picture and therefore appears to be due to an actual alteration in the flow rather than secondary to an increased blood volume.

Inulin clearance studies indicated an elevation from the fifteenth to the thirty-eighth week of pregnancy which returned to normal in the early puerperium. The filtration fraction followed the behavior of the glomerular filtration rate. Plasma creatinine and urea nitrogen were both reduced during pregnancy and returned to normal in the puerperium.

Parity, age, and posture were observed for their effect on renal function tests and apparently exerted none. The clinical implications of these observations do not appear clear at the moment except that one can expect lower values for creatinine and urea nitrogen during pregnancy than during the nonpregnant state. The authors discuss the possible mechanisms of the renal changes. The evidence available at the present time indicates there is apparently no hypertrophy of the kidney nor is there any evidence suggesting that an increased number of glomeruli are activated during pregnancy. Some evidence indicates, however, that certain hormones are involved in the alteration of the renal function tests. Thyroid hormone and the somatotrophic hormone of the anterior pituitary gland may be related to renal function.

—*James F. Donnelly, M.D.*

Megaloblastic Anemia of Pregnancy and the Puerperium. C. GILES and EILEEN SHUTTLEWORTH. *Lancet*, Lond., 1958, 2: 1341.

THE PRENATAL CLINICS associated with the City General Hospital, Stoke-on-Trent, and the Limes Maternity Hospital have a high incidence of anemia. Investigations were carried out to determine the incidence of megaloblastic anemias as opposed to the normoblastic or iron deficient anemias. An arbitrary level of 65 per cent, or 9.5 grams of hemoglobin. was selected. All patients whose hemoglobin level was below this amount were examined for the presence of megaloblastic anemia. There were 474 patients in this category.

These patients were subjected to sternal marrow puncture, reticulocyte count, serum-iron estimations, and determinations of gastric acidity, serum-bilirubin, and fat absorption. There were 90 cases of megaloblastic anemia diagnosed, representing 2.8 per cent of the total hospital admissions. This figure is considerably higher than in any series which has been previously reported.

Clinically, these patients exhibited no specific features, although megaloblastic anemia was more common in the older age groups and was also more common in the multiparas and in patients with multiple pregnancies. The dietary history seemed to indicate some deficiency, particularly in the animal proteins. All of the patients responded well to folic acid. Vitamin B_{12}, on the other hand, had little or no effect and when given alone was often deleterious. No evidence was procured during the study which indicated the possible etiologic factors of the anemia.

—*James F. Donnelly, M.D.*

The Pfannenstiel Incision for Cesarean Section (A incisão de Pfannenstiel para a cesárea abdominal). JORGE DE REZENDE, ROGÉRIO ROCCO, JEAN CLAUDE NAHOUM, WILSON MERCADANTE, and PAULO BELFORT DE AGUIAR. *Rev. gin. obst.*, Rio., 1958, 103: 523.

THE AUTHORS report on their experience with 347 cases of cesarean section in which the Pfannenstiel incision was used. The time required for delivery of the fetus was comparable to that of the other common techniques. The total time required for the operation was also no longer than usual. Perinatal morbidity and mortality were low and did not depend on the shape of the incision. There were no postoperative complications attributable to the Pfannenstiel incision.

The many advantages offered by this incision and the absence of specific disadvantages justify its routine use.

—*Jonas Brachfeld, M.D.*

Transabdominal Amniocentesis, Indications and Technique (Amniocentese transabdominal, indicacões e técnica). JEAN CLAUDE NAHOUM. *Rev. gin. obst.*, Rio., 1958, 103: 575.

TRANSABDOMINAL AMNIOCENTESIS is a simple and benign procedure which has largely displaced amniocentesis via the transvaginal route. Amniocentesis is being performed with increasing frequency not only for research purposes but also for clinical ones. The amniotic fluid may be desired for biochemical and cytologic studies and for a variety of other studies

(fetal sex determination, fetal blood grouping, evaluation of fetal hemolysis). The procedure may be used for symptomatic therapy in acute polyhydramnios, and during labor to improve uterine contractions. Radio-opaque media may be injected for amniography.

The research applications of this technique comprise amniotic fluid volume measurements, studies of amniotic fluid circulation, and amniotic (and hence, intrauterine) pressure recordings.

The technique, risks, and complications of transabdominal amniocentesis are discussed by the author on the basis of his experience with 93 procedures in 84 patients. —*Jonas Brachfeld, M.D.*

LABOR AND ITS COMPLICATIONS

Prolapse of the Umbilical Cord with Special Reference to Its Etiology and Treatment. MATS AHLGREN. *Acta obst. gyn. scand.*, 1958, 37: 526.

PROLAPSE OF THE UMBILICAL CORD is an uncommon complication of labor and the fetal mortality is still extremely high, some cases not being diagnosed until after the fetus has died. One hundred and fifty-one cases of cord prolapse occurred between 1941 and 1955. This represented an incidence of .18 per cent. According to most investigators the fetal mortality associated with prolapse of the cord is between 30 and 50 per cent.

The most important etiologic factor in the occurrence of prolapse of the umbilical cord is a faulty fit of the presenting part in the lower uterine segment. This faulty fit can be caused by abnormal position. This is demonstrated by the fact that in this series of 151 cases breech presentation occurred in 58.3 per cent and transverse presentation in 2 per cent. Other causes of faulty fit include infants that are too large or too small, as well as twin pregnancies. It can also be due to prolapse of an arm or placenta previa. Another important etiologic factor is the length of the umbilical cord and its position. Finally, hydramnios, obstetrical manipulations, and marginal insertion of the cord must be considered as etiologic factors in prolapse of the cord.

Usually the prolapse of the cord takes place in close connection with the rupture of the membranes. Therefore it is of the greatest importance to auscultate the fetal heart sounds and make a rectal examination as soon as possible after the rupture of the membranes. If there is reason to believe that some of the aforementioned etiologic factors can play an important role the delivery should be conducted with increased vigilance. Vaginal examination gives the final diagnosis.

As far as treatment is concerned, when the fetus is dead, treatment is of no value in uncomplicated cases. To get as many "salvageable" cases as possible, early diagnosis and supervision during labor are most important. In order to lower the fetal mortality in prolapse of the cord, cesarean section should be performed if vaginal delivery cannot be safely undertaken. Recent investigations point to the importance of the fetal blood pressure and the position of the umbilical cord and the amniotic sac.

—*Harry Fields, M.D.*

NEWBORN

The Respiratory Distress Syndrome and Its Relationship to Hyaline Membrane Formation. WILLIAM ALLEN BAUMAN. *Bull. Sloan Hosp. Women*, 1958, 4: 113.

A PREVIOUS STUDY had indicated that respiratory difficulty during the early life of an infant was associated with the presence of hyaline membrane at autopsy. The present study was designed to evaluate the clinical symptoms of respiratory distress in relation to the subsequent formation of a hyaline membrane. Respiratory distress in a newborn is manifested by:

1. Intercostal retraction
2. Strong inspiratory movements of the chest wall
3. Collapse of the thoracic cage with abdominal extension
4. Hypoxia as indicated by cyanosis
5. Diminution of the breath sounds and the presence of rales
6. Expiratory grunt
7. Dilatation of the alae nasi
8. Descent of the chin and opening of the mouth

The respiratory rate is usually rapid, but variable, and it decreases in the terminal phases. Distress is usually manifest within a few hours after birth and usually reaches a maximum in 36 to 48 hours. Death will occur at this time as a rule. Roentgenographic changes are not specific since some of the findings are often noted in children who have no clinical evidence of respiratory distress.

Two hundred and sixty-three premature infants admitted to the Premature Nursery of the Babies Hospital between December 1956 and March 1958 were studied. A scoring system based upon signs of retraction was utilized in the evaluation of the infants. All of the various signs of retraction were closely correlated with hyaline membrane disease with the exception of the descent of the chin which appeared not to be a reliable clinical symptom of respiratory distress associated with pulmonary hyaline membrane disease. The frequency of hyaline membrane disease is inversely related to birth weight. Respiratory distress during the neonatal period is associated with a mortality of 60 per cent. Half of the infants were found to have pulmonary hyaline membrane disease. One-third of the infants with evidence of respiratory distress with retraction survived without any specific treatment. —*James F. Donnelly, M.D.*

Hyaline Membrane Disease. EDWARD B. CANTOR, MELVIN SILVERMAN, KAMEL BALADI, and LOUIS J. BRAHEN. *Obst. Gyn.*, 1958, 12: 632.

THIRTY-SIX CASES of neonatal death from hyaline membrane disease, occurring over a period of 6 years, were reviewed. Approximately 1 infant of every 400 delivered succumbed from hyaline membrane disease. In the period from 1951 to 1956, there were 1,767 cesarean sections and 12,656 vaginal deliveries at The Cedars of Lebanon Hospital, Los Angeles, California. There were 11 deaths in the cesarean section group and 25 among the vaginal deliveries. There were no deaths of infants from mothers who had cesarean section who had been in labor.

Of the infants weighing more than 2,500 gm., 4 were delivered vaginally and 3 by cesarean section.

The incidence of this disease in infants delivered per vagina is higher than previously reported.

The exact mechanism of the production of these membranes is not known, but prematurity and cesarean section appear to be important predisposing factors. Others suggest that diabetes also plays an important role. The authors were unable to correlate cardiac failure with occurrence of the membranes. The possible role of metabolic dysfunction of the mother is as yet unsettled.

Consideration should be given to the following: 1. Every effort to avoid premature labor should be made. 2. Cesarean sections should be done after careful evaluation and every possible consideration has been given to the possibility of a vaginal delivery. 3. All infants delivered by cesarean section should be carefully aspirated. The pharynx, as well as the stomach, should be aspirated routinely with a small, soft rubber catheter. 4. Should the infant require oxygen, the concentration should be kept under 40 per cent and should be provided with a relative humidity (not mist) of 65 to 100 per cent. If oxygen is not needed, similar humidity should be maintained. 5. Infants born of diabetic mothers, regardless of birth weight, should be treated as if premature. 6. At the first sign of respiratory distress, roentgenograms of the chest should be taken as an aid in the diagnosis. 7. If at any point heart failure becomes evident, immediate digitalization should be instituted.

—Charles Baron, M.D.

MISCELLANEOUS

The Transmission of Transfused Sickle-Trait Cells from Mother to Fetus. NICHOLAS T. MACRIS, LOUIS M. HELLMAN, and R. J. WATSON. *Am. J. Obst.*, 1958, 76: 1214.

A NEW METHOD has been suggested to investigate whether intact maternal erythrocytes cross the placental barrier. Donor blood with the sickle-cell trait but without sickle-cell anemia was selected for this purpose. When erythrocytes with the sickle trait are exposed to a decreased oxygen tension, they assume a characteristic sickled configuration which is easily recognized. A group of pregnant women was therefore injected with sickle-trait blood and the blood of their infants was examined for sickle cells.

The subjects of this study were 25 Rh-positive pregnant women at or near term. Twenty-one of the subjects were transfused with 500 ml. each of sickle-trait whole blood preserved in acid citrate dextrose (A.C.D.) solution. In 3 instances the supernatant plasma in 500 ml. of whole blood was removed, allowing the sickle-trait cells to be given in a reduced volume. The elapsed time between the end of the transfusion and the delivery ranged from 40 minutes to 153 hours and 2 minutes. Nineteen of the women were delivered vaginally and 6 by cesarean section. Whole blood was collected both from the umbilical cord at delivery and from the mother within 12 hours after delivery. A combination of dried ammonium and potassium oxalates was used as the anticoagulant. The blood from the umbilical cord was collected with the utmost care to prevent contamination with the maternal blood.

Sickle cells were found in the umbilical cord blood of the newborn infant in 3 of the 25 cases studied. The placental passage of sickle-trait cells in 3 of 25 experimental subjects adds to the already existing evidence that in a small percentage of patients maternal red cells traverse the placental barrier and are found in appreciable numbers in the fetal circulation. The mechanism of transfer is obscure. While breaks are known to occur in the fetal circulation, the pressure relationships are thought to be such that direct passage must always occur from fetus to mother. On the basis of certain assumptions from the data studied, the fetus in at least one instance must have received at least 5 ml. of sickle-trait cells. The facts of transfer can no longer be denied, although the mechanism remains obscure.

—Harry Fields, M.D.

The Elderly Multigravida. D. FRANK KALTREIDER. *Obst. Gyn.*, 1959, 13: 190.

FOR PRACTICAL REASONS, the pregnant woman past the age of 35 is considered "elderly." Beyond this point, there is a sharp increase in the incidence of medical and obstetrical problems which makes pregnancy more hazardous for both mother and child. However, while we are alert to the dangers faced by the elderly primagravida, we are inclined to overlook the fact that the elderly multigravida is subject to an even greater frequency of complications. And when it is considered that there are seven times as many elderly multigravidas as primagravidas, it becomes important to give close attention to this special group of patients. We should not allow ourselves to be misled by the fact that previous pregnancies were uneventful. A study of more than 22,000 deliveries at the University Hospital in Baltimore reveals the hazards to the elderly multigravida. The maternal mortality is about ten times the state average, due principally to concurrent medical disease. Perinatal mortality is increased to more than 5 per cent. About 40 per cent of the infant deaths are associated with maternal hypertension and 10 per cent with congenital anomalies. There are greater percentages of smaller and larger babies.

The incidence of hypertension is almost 21 per cent. It is thought that this increase is partially due to age alone, but that it is made even higher by the combination of age and parity. As might be expected, a greater percentage of these patients have chronic hypertensive disease or chronic hypertension plus toxemia, and a lesser percentage have toxemia alone. The greatest perinatal loss (28 per cent) occurs in the group with toxemia superimposed on hypertension.

The incidence of heart disease is twice that of the clinic average. Whereas the younger patient is apt to have a rheumatic heart, the older patient evidences the results of prolonged hypertension and is prone to have symptoms of failure. Diabetes is three times as prevalent, but the effect on perinatal loss is no different than for the younger individual unless the diabetes is long-standing.

Other increased problems include antenatal hemorrhage, malpresentation shoulder dystocia, and multiple pregnancy. The section rate for the elderly multigravida is nearly twice that for the younger multigravida, but the indications for section are sim-

ilar. Uterine rupture, laceration, and postpartum hemorrhage are common threats to all multigravidas.

Finally, it must not be forgotten that there may be an adverse psychologic effect on a patient who thought or hoped that her childbearing was at an end.

—*Lester T. Hibbard, M.D.*

Staphylococcal Infection in a Maternity Hospital. W. A. Gillespie, K. Simpson, and Rosemary Tozer. *Lancet*, Lond., 1958, 2: 1075.

A bacteriological study was carried out in the Bristol Maternity Hospital over a 2 year period. The investigation was carried out among the full term infants who were kept in a nursery except for feeding. There were two nurseries on different floors. Premature infants and sick infants were in separate nurseries and were not included in the study. Frequent cultures were made from the newborn infants. The cultures were taken from the back of the neck, the nose, the umbilicus, and the groin as well as other areas. Cultures were also taken from the personnel, the mothers, and the hospital equipment. Staphylococci could be cultured from most infants by the time there were 2 days old. The umbilicus was the earliest site of colonization followed shortly by the groin, then the nose, and the neck. Although the cultures usually yielded only one strain, occasionally two separate strains were noted. Infections were considered to be from the umbilicus to the nose and to the groin rather than from the nose to the umbilicus.

Although a wide variety of strains of staphylococci was obtained, phage groups 1 and 3 predominated. Furthermore, 69 per cent of the strains isolated were found to be resistant to penicillin. Group 3 strains were most commonly located in the umbilicus and groin, a pattern similar to that noted in cross-infection in open surgical wounds. Group 1 strains were most commonly found among the nurses; this was also true of the nurses who worked on surgical wards even though strain 3 might be predominant on the ward. The strains found upon the nurses' hands were also found more frequently upon the infants. Occasionally a bacteriologic epidemic caused by a particular strain was noted although little or no clinical disease was present. Most of the staphylococcic infections were caused by penicillin-resistant strains; however, one phage-type 70 penicillin-sensitive strain did cause pemphigus in 17 infants. The sensitivity to penicillin suggested one of the mothers as a source. The incidence of clinical infection was 11.8 per cent; usually it occurred in the second week of life. Most of the infections were mild and consisted of pustules which were more common in the areas of irritation. It was noted that the infants who became heavy carriers by the second day of life tended to have a greater incidence of sepsis. The incidence varied somewhat depending on the strain. It was greater with phage group 1, particularly with strains 52A/79 and 80.

The first of the methods used to reduce the infections was disinfection of bedding and garments, which was carried out during the laundering process. Blankets and garments were disinfected with "cirrasol OD." Disinfection successfully reduced the bacterial counts and also appeared to be responsible for the reduction of bacteria in the area of the nursery, but it failed to reduce the incidence of staphylococcal cross-infection or sepsis. The second measure taken was the use of a disinfectant hand cream by the nurses. This hand cream contained 1 per cent chlorhexidine. A small amount of this was rubbed into the hands by the nurses after handling each infant. Following the introduction of this procedure in one of the nurseries, a reduction in the incidence of cross-infection was noted. The hand cream was then switched to the other nursery and the results indicated that the cream was of some benefit in reducing the incidence of cross-infection from staphylococcal infection. Since the umbilical cords seemed to be the primary site of infection the third preventive measure was directed toward preventing the colonization of the umbilicus. The cord was sprayed with a plastic spray and subsequently dusted daily with a hexachlorophane powder. There was a marked reduction in the staphylococcic colonization of the umbilicus. Dummy powders failed to give protection against staphylococcal colonization.

The authors believe that all three measures should be taken. In spite of this the nasal colonization of the infants with staphylococci will increase with age, but this increase is slower and the ultimate amount of colonization is lower. The addition of dusting of the perineum and groin with hexachlorophane powder and tub bathing with a hexachlorophane soap might further reduce staphylococcic cross-infection.

—*James F. Donnelly, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Endoscopic Pyeloscopy: A New Procedure for the Diagnosis of Disease of the Renal Pelvis and the Simplified Removal of Stones from the Renal Pelvis (Die endoskopische Pyeloskopie: Neues Verfahren der Nierenbeckendiagnostik und Grundlage der vereinfachten Entfernung von Nierenbeckensteinen). HEINRICH VON ROHR. *Zschr. Urol.*, 1958, 51: 697.

THE TECHNIQUE which the author describes in this article and which he has tested by inspecting the kidneys of 14 live pigs, as well as those of cadavers, is carried out by means of a special instrument and with the aid of a specially designed x-ray machine. The x-ray machine permits accurate localization of the calyces and of opaque stones within the drainage structures of the kidney. The purpose of this technique is to avoid, when possible, open renal surgery for the removal of small stones in the calyces or in the renal pelvis. The direction of the calyces is determined through the use of a retrograde pyelogram.

A trocar is then passed through a small cutaneous incision in the back through the renal capsule, and is directed through a suitable calyx into the renal pelvis. The sharp-pointed obturator is removed from the trocar once it penetrates the renal capsule, and is replaced by one which is more blunt. Once the trocar is in the pelvis of the kidney, the obturator is removed and a specially designed observation endoscope is passed through the trocar. The renal pelvis can thus be accurately visualized. The opening of the ureter into the renal pelvis, stones, or tumors in the pelvis can be readily seen. The endoscope may be replaced by grasping instruments and stones extracted. The author performed about 30 transcutaneous pyeloscopies.

A careful study of the renal arterial tree in relationship to the renal pelvis and calyces shows that these vessels become very small and attenuated when they reach the renal parenchyma, especially along the lateral convex border of the kidney. The author believes that for these reasons pyeloscopy of the human kidney in situ should be possible without serious complications.

—S. Richard Muellner, M.D.

Renal and Ureteral Calculi in the Infant (La calcolosi reno-ureterale nell'infanzia). G. ROLLO and B. TORCHI. *Arch. ital. urol.*, 1958, 31: 394.

THE AUTHORS report a series of 9 cases of calculi in the upper urinary tract of children. These cases were observed between 1938 and 1957. The ages of the patients varied between 5 and 12 years. The type of stones found were the same as those found in the adult. The major portion of the stones was found in the kidney with a relative rarity of ureteral stones noted.

The authors discuss the symptomatology and state that pyuria is always present. Hematuria was present in 6 of the 9 cases, renal colic was noted in 3, and less typical pains noted in 4. Other urinary tract symptoms were much less common. Fever was noted in 7 of the 9 cases. Therapy was thought to be exclusively surgical and no operative deaths occurred.

—Nicholas Wetzel, M.D.

Some Observations on Renal Biopsy with Reference to Bright's Disease. J. D. WILLIAMS. *Guy's Hosp. Rep.*, Lond., 1958, 107: 373.

THE DEVELOPMENT of renal biopsy as a safe technique has helped to provide information especially concerning some aspects of Bright's disease, and may allow more exact diagnosis and treatment. The procedure has little danger. The risk of bleeding after biopsy is increased in uremia and in the malignant phase of hypertension. Microscopic hematuria is usual. Gross hematuria is sometimes seen and occasionally a perirenal hematoma may be formed. The indications for its use depends upon the value attached to accurate diagnosis and whether biopsy will provide more information relevant to the prognosis and treatment.

Renal biopsy has proved of value in a variety of renal conditions. Amyloidosis, diabetic glomerulosclerosis, disseminated lupus erythematosus, nephrocalcinosis, and other tubular degenerative disorders may be detected. At present renal biopsy would appear unlikely to be of value in the management and diagnosis of acute glomerulonephritis in the typical case.

In subacute glomerulonephritis the histologic appearances are varied. Clinically, if albuminuria is marked, secondary edema may result. The serum lipid level is raised and the clinical picture is that of a nephrotic syndrome. As this picture may be produced by other diseases in which diffuse glomerular lesions are present, exact diagnosis may be impossible on clinical grounds alone and renal biopsy may thus be of value.

In chronic pyelonephritis renal biopsy may yield a pathogenic organism when repeated urine cultures have proved negative. More frequently bacteria appear in the urine after biopsy, presumably released into the urinary tract as a result of the trauma of biopsy which causes breakdown of fibrous tissue or inflammatory barriers. It has been shown that, when positive culture was obtained from the renal biopsy sample or from the urine right after biopsy, severe damage was present in the kidney.

In cases of hypertension there is a good general correlation between the degree of renal arteriolar sclerosis and the clinical evaluation of the severity of the disease. Little information is yet available regarding the influence of renal biopsy in the management of hypertension and the selection of patients for hypotensive therapy, although some reports indicate its usefulness in selected cases.

The nephritides associated with disseminated lupus erythematosus have in the past been regarded as examples of glomerulonephritis. In recent years the distinction between the nephritides and the glomerulonephritis has been made with greater ease. The

most characteristic lesion is a focal thickening of the capillary basement membrane usually toward the periphery of the glomerular tuft. The "wire loop" lesions seen in all autopsy material were present in only 29 of 40 biopsy specimens. There is a general correlation of histologic and clinical features.

The development of percutaneous renal biopsy has made available histochemical, cytochemical, and electronmicroscopic studies of kidney tissues providing more information of the changes present during life in the diseased kidney. In clinical medicine, renal biopsy affords a means of more precise diagnosis and consequently may influence prognosis and treatment.

—*R. O. Beadles, M.D.*

The Use and Function of the Artificial Kidney. F. M. Parsons and B. H. McCracken. *Brit. J. Urol.*, 1958, 30: 463, 473.

The authors present results noted following 129 dialyses on 85 patients and describe modifications of the Kolff-Brigham artificial kidney to increase the rate of flow and the dialyzing surface area. These modifications consist of a larger cannula for insertion into the radial artery, a larger compressor to increase the capacity of the pumping system, and the use of 160 to 168 feet of cellophane tubing instead of the customary 138 feet.

The studies indicate that little improvement of the clearance rate of urea is obtained by increasing the dialyzing surface area above 2,000 sq. cm. unless the flow rate is increased above 300 ml. per minute. When the flow rate through the dialyzer is increased to 500 ml. per minute and the dialyzing surface area is 2,800 sq. cm., the clearance rate of urea and creatinine is increased by approximately 40 per cent.

The dialyzing surface area becomes more important and the flow rate less important, however, when substances of higher molecular weight are present. Thus, phosphate and para-aminohippuric acid attain a nearly maximal clearance at flow rates of 300 ml. per minute and larger molecules attain maximum clearance at even lower rates of flow.

The authors have failed to notice cardiovascular disturbances or hypertension as a result of increasing the flow rate above 200 to 300 ml. per minute. Increase of the blood flow and the dialyzing surface area, however, has certain disadvantages. It is necessary to regulate the rate of flow carefully to avoid increasing or decreasing the patients' blood volume. Furthermore, more blood is required to prime the machine.

The authors express their satisfaction with their modifications of the Kolff-Brigham machine. In most instances they have been able to achieve a reduction of blood urea nitrogen from 200 mgm. per cent to 30 mgm. per cent during a 6 hour dialysis. They believe that the described modification may spare the patient one or more dialyses.

—*Laurence F. Greene, M.D.*

Anatomic Study of the Terminal Ureter (Etude anatomique de l'uretere terminal). S. de Miguel. *Arch. urol. belg.*, 1958, 26: 197.

No uniform criteria of the structure of the terminal ureter exist. The difference of opinion, according to Bosque, may be due to the fact that transverse section of the juxtavesical ureter shows that the various fibers seem to be irregularly arranged. This irregularity disappears when the longitudinal sections are studied. He also pointed out a second reason for the lack of precise knowledge of the architecture of the terminal ureter, that is, the circular muscle fibers are not horizontal but are always placed in a more or less oblique position and are without apparent transition since they appear as a continuation of the longitudinal fibers. The muscle bundles of the ureter form a system of spirals surrounding the entire organ. These spirals do not run in only one direction but take two opposite directions and form interlacing muscle bands. These spirals begin in the internal muscular layer and pass, after surrounding the organ, to the external layer. The muscle bands of the internal layer form the so-called circular horizontal fibers, whereas the fibers of the external layer run in a vertical direction. The longitudinal fibers make up this portion of the ureter. These two muscular layers, the internal and external, are really not separate layers but are parts of the same system of muscle bundles.

The author has studied the terminal ureter by making sections from the human fetus and also from the cat. He has studied this area by obtaining a series of 12 micron sections taken both in a longitudinal and horizontal direction. From the study of these sections, the author has determined the structure of the terminal 3 cm. of the ureter. From a morphofunctional point of view, he considers the ureter to be divided into three zones: (1) an extravesical zone, consisting of that portion of the ureter outside the bladder; (2) an intramural zone consisting of that portion of the ureter associated with the vesical detrusor mechanism, and (3) a third portion, the meatal or intramucosal ureter, which no longer is associated with the detrusor portion of the bladder but ends in the trigonal meatus, extending under the mucosa of the trigone.

In the human ureter, the sections of the extravesical zone show three types of fibers: an internal layer of circular fibers, a second more peripheral layer of longitudinal fibers, and a third still more external layer of equally longitudinal fibers.

In the intramural zone, the circular fibers become less evident and almost disappear in the lowest portion. Thus the longitudinal fibers in this area are separated not by circular fibers but by very thin partitions of connective tissue that have a honey-combed appearance. It is in this area that the muscle fibers of the bladder form loops of muscles that surround the ureter and morphologically present the aspect of a sphincter. At the lower edge of the ureter, the muscle fibers form a loop or an X. These muscles correspond to the intramural portion of the ureter and represent a prolongation of the fibers into the bladder musculature, anastomosing and interlacing with those of this portion of the ureter. From the study of the longitudinal and horizontal sections of the ureter in this area, it would thus seem that the muscle bundles of the bladder form a sphincter whose function is to keep the ureter closed during the intervals between ejaculations of urine.

The intermucosal portion of the ureter changes in position, and follows a more oblique direction towards the center of the bladder. The fibers in this area are

longitudinal and are not reinforced by bladder fibers. The author after carefully studying the sections of this area has not demonstrated a mucosal valve that would contribute to the closure of the ureter during urinary ejaculation.

From this study, the author has concluded that the ureter has three phases of contraction during the expulsion of urine. The first phase is that in which the urinary bolus produces a shortening and widening of the ureter. The second phase consists of a peristaltic wave that rapidly involves the ureter extending from the superior to the inferior extremity. It is this second phase that propels the urine toward the bladder and opens the meatus for the peristaltic wave at this level. The forceful peristaltic wave, or contraction, causes a relaxation of the sphincterlike muscle fibers of the bladder which surround this portion of the ureter. During the third phase a new movement takes place which reverses the process and restores the usual caliber and length of the ureter. This is the mechanism by which the sphincter action is completed.

The opening and closing of the ureter then is dependent upon an antagonistic reaction between the intramural sphincter and the intrinsic and extrinsic ureteral musculature of the terminal extravesical ureter.

This study causes the author to reject the hypothesis that the passive closure of the ureter is due to its penetration through the bladder wall. He did not find the mucosal valve which has previously been thought to be present in this portion of the ureter.

—*Conrad A. Kuehn, M.D.*

BLADDER, URETHRA, AND PENIS

Construction of a Substitute Urinary Bladder from Ileum and Colon. AARON HARDY ULM. *Arch. Surg.*, 1959, 78: 122.

THE AUTHOR presents a description of the technique, indications, and the results of a new ileosigmoid substitute for the human bladder. This procedure should be reserved for young male patients who have cancer above the trigone. It should not be used when the tumor involves, or may involve the prostate, the seminal vesicles, or the trigonal area.

The first stage of the operation consists of creating an ileal conduit to which the ureters are anastomosed. The second stage is carried out 14 days to a month after the first stage and cystectomy is done, being careful to leave both the seminal vesicles and the prostate. Then a 12 inch section of sigmoid is removed and bowel continuity is restored. The distal end of the resected sigmoid sleeve is anastomosed to the transected prostate gland with interrupted sutures. The proximal limb of the sigmoid sleeve is brought out in the midportion of the abdominal incision as a nonfunctioning colostomy. A polyvinyl tube is passed through the urethra and the sigmoid sleeve.

When healing has occurred, the functional capacity of the sigmoid bladder can be demonstrated by filling the sleeve through the colostomy and permitting the patient to void per urethram.

The third stage consists of an end-to-end anastomosis between the ileal stoma and the sigmoid stoma, care being taken to preserve the pouting ileal nipple. This nipple is inserted into the stoma of the sigmoid and anastomosis is performed. Before the anastomosis is begun, a polyvinyl tube with multiple perforations is passed through the urethra and the sigmoid sleeve into the ileal conduit for a few inches, and urine will be drained to the exterior through this tube. Before the tube is removed, sound healing should be demonstrated with a cystogram.

The author cites one case in which this procedure was carried out, the main difficulty being with the anastomosis between the prostate and the sigmoid which, in both the second and third stages, leaked some urine. The author postulates that it would probably be best to have the patient leave the hospital for several months between the second and third stages to assure a solid union in this area where there is so little affinity of the tissues. The author reports that the patient has no disturbance of his sexual function, that he has been able to return to his regular occupation, and that he is continent.

—*Robert O. Beadles, M.D.*

Perineal Urethral Diverticulum—Complication of Removal of Ischium. A. ESTIN COMARR and ERNEST BORS. *J. Am. M. Ass.*, 1958, 168: 2000.

REMOVAL OF THE ISCHIUM is an accepted treatment for ischial decubitus ulcers in patients with injuries of the spinal cord. Of 48 patients who had this operation 22 had diverticula. Of these, 12 patients had had unilateral removal of the ischium and only one had diverticulum, while of 36 with bilateral removal, 21 showed diverticula of varying size and shape. These patients were examined by urethroscopy through the panendoscope and by the roentgenographic technique in which 150 c.c. of "skiodan" solution are permitted to fill the urethra and bladder by the gravity method; anteroposterior and right oblique exposures were then taken. With this technique it is possible to detect other not infrequent complications of the penoscrotal urethra, of the bladder wall, and of the vesicoureteral junction.

The pathogenesis of the condition is that the hindmost part of the anterior mobile urethra is unprotected by muscles and, therefore, vulnerable to external trauma. Its only protection in the sitting position is the hollow which is formed by the out-jutting ischial tuberosities. The diaphragmatic urethra is originally well protected by the triangular ligament suspended between the inferior pubic rami. By removal of the tuberosities of the ischium both mechanisms are disturbed: the protection of the pars nuda and the suspension of the diaphragmatic urethra. The entire part is exposed to pressure and, therefore, to mucosal damage with all its consequences of periurethral extravasation, abscess, fistula, or formation of diverticulum.

Diversion of the urinary stream of cystostomy is no guarantee against the development of this complication. The treatment consists of intraurethral catheter drainage, even when a suprapubic cystostomy is present. Accompanying perineal decubitus or ischial sinuses are treated by brine baths, exposure to air, and dusting with sugar. General supportive therapy, such as multiple feeding of high protein and high carbohydrate diets, administration of testosterone as an anabolic agent, and blood transfusion, is given.

Prevention is more important than the therapy. Prophylaxis is twofold: 1. The patient must be indoctrinated not to jeopardize his ischial region by prolonged sitting, which leads to ulceration and may end in the development of the diverticulum. 2. When the removal of the ischium is performed the inferior pubic ramus must be spared as much as possible in order not to interfere with the suspension of the triangular ligament. The idea of "prophylactic removal of the ischium" must be rejected.—*Robert O. Beadles, M.D.*

A Review of 165 Cases of Hypospadias. F. T. MOORE. *Plastic & Reconstr. Surg.*, 1958, 22: 525.

HYPOSPADIAS is an anomaly resulting from the failure of ventral closure of the urethra. At the present time there is no one type of operation which is an elective procedure for all degrees of hypospadias. Denis Browne states the requirements for a satisfactory operation are:

1. It must be applicable to all degrees of the deformity.
2. It must construct a urethra free from hairs on the inside.
3. The new urethra must be of an approximately normal size and elasticity.
4. It must be capable of completion by the time the child goes to school. An acceptable repair should overcome penile curvature in order that satisfactory intercourse can take place, should enable a stream to be projected forward with the patient standing, should be devoid of new disabilities such as stricture formation and growth of intraurethral hair, and finally it should be cosmetically satisfactory.

The repair of hypospadias requires two stages. The first is the correction of ventral curvature by excision of the fibrous cord that replaces the normal urethra and covering of the skin defect by the use of preputial skin as described by Edmunds, or the method used by Denis Browne. The Edmunds' method is a two stage procedure using a tubed pedicle prepared from the dorsal preputial apron. In the Denis Browne method a transverse cut is made proximal to the glans and all the contracted tissues down to the corpus are divided and allowed to slide toward the base of the penis. The transverse skin incision is then sewn up longitudinally. A dorsal incision is needed to relieve tension on the suture line. The author objects to the midline ventral scar that results, which in turn may reproduce the ventral curvature, and recommends that the ventral scar should be staggered using the multiple Z-plasty principle.

The second stage of the repair is usually undertaken before the child goes to school. In Great Britain three methods are in use, the Ombredanne, Denis Browne, and McIndoe methods. With small defects of the urethra and little or no bowing, the Ombredanne technique is a useful method of repair. Twenty-six patients were repaired by this method. It has one main fault, that there is spraying on micturition. Its advantages are that there is no need for diversion of the urinary stream, it is simple to perform, and no special instruments are necessary. The technique of this method is described. Browne rightly or wrongly believes his method applicable to all degrees of hypospadias and 76 patients were treated by this method. Forty-six of 72 repairs were complicated by postoperative fistulas. Eighty-five per cent micturated with a spray. Twelve of 15 of these children who had become adults still had varying degrees of chordee. The Denis Browne technique is described in detail.

Sixty-four patients were treated by McIndoe's method, which is a good operation but occasionally fails because the dilator can begin to cut through the new urethra if not closely watched. This procedure consists of the use of a thin razor graft from the hairless side of the arm applied to a gum elastic catheter which fits over a special trocar that is thrust subcutaneously through the previously prepared channel from the hypospadiac meatus to the dimple at the tip of the glans. When the catheter is removed a permanent dilator of suitable size is introduced which is never left out of the urethra for longer than 5 minutes. After 6 months have passed, the dilator is removed and the posterior end of the urethra and the hypospadiac meatus can then be anastomosed.

All of these operations except the Ombredanne require diversion of the urinary stream which can be accomplished by either suprapubic cystotomy, perineal urethrostomy, or indwelling urethral catheter. The author believes that an indwelling catheter which may traverse the repair is the best method of draining the bladder. The author repaired 21 hypospadiacs using the Young modification of McIndoe's method in which a split thickness graft or full thickness graft of the prepuce was used to reconstruct the urethra, and the bladder was drained through the same catheter that was used to introduce the graft.

—*Robert O. Beadles, M.D.*

GENITAL ORGANS

Some Comments on the Long Term Results of Endocrine Treatment of Prostatic Cancer. L. M. FRANKS. *Brit. J. Urol.*, 1958, 30: 383.

THE AUTHOR points out that the response of many prostatic cancers to antiandrogenic treatment is dramatic and, clinically, primary and secondary tumors become progressively smaller and some almost disappear. Tumors which respond in this manner to endocrine treatment are referred to as hormone-sensitive or hormone-dependent, but this term can be applied only to the cells which respond and not to the whole tumor. Hormone sensitivity, therefore, is not a property of the tumor as a whole, but may vary from part to part of the same tumor.

Not all patients with prostatic cancer will respond to castration or estrogen treatment. At least 20 per cent of patients with active cancer fail to show regression, and in many cases in which there was original response to treatment relapse occurred ultimately. Furthermore, 70 per cent of all patients with prostatic cancer die within 3 years, whatever form of treatment is given. Of the untreated patients about 85 per cent are dead by this time.

Thus, from these figures it appears that patients with clinical prostatic cancer can be divided into three groups. The first group, about 70 to 75 per cent of the treated patients and 85 per cent of the controls, dies within 3 years. This includes an estimated 20 per cent of all the patients who did not respond to en-

docrine treatment at all and died within the first year. After 3 years, the difference in survival between the treated and untreated patients becomes more marked. By 5 years, 25 to 30 per cent of the treated patients, but only about 5 to 6 per cent of the controls survive. The second group of patients, therefore, is this 25 per cent surviving more than 5 years after treatment, and the third group, the 5 per cent surviving for this period without treatment.

The author suggests that in the majority of the patients, that is, those dying in the first 3 years, the effect of treatment on the survival time may be an indirect effect due to relief of urinary obstruction and control of infection, without any alteration in the natural history of the cancer itself. The patients who have survived for more than 3 years, on the other hand, may be those who have tumors which have been truly retarded, either by treatment or naturally. A natural mechanism which retards the growth of the tumor must be responsible for a patient's survival beyond 5 years without treatment.

—*Laurence F. Greene, M.D.*

Endocrine-Control Therapy in Prostatic Cancer. J. D. FERGUSSON. *Brit. J. Urol.*, 1958, 30: 397.

THE AUTHOR presents data concerning the results of endocrine treatment in an unselected group of 344 consecutive patients with prostatic carcinoma. At the time of this report 255 patients were dead, and their deaths were ascribed either to prostatic cancer or intercurrent disease. It was noted that, irrespective of the length of survival, most of the patients who died under the age of 70 died from cancer; among those who died when more than 70 years old the difference between cancer and other causes regularly declined with the advancing years. Accordingly, the risk of dying from metastatic disease became correspondingly less as age increased. Cancer of the prostate exhibits its greatest danger during the period of functional endocrine activity and, irrespective of treatment, age offers the best index of the prognosis.

Two hundred and eighty-eight patients were treated with stilbestrol or its equivalent. In the earlier cases a sustained dosage of between 5 and 15 mgm. was employed, but later when it became clear that relapsing cases might respond again to larger amounts, a regular maintenance dose of 100 mgm. a day became routine. Fifty-six patients received no endocrine treatment and served as controls. Eighteen per cent of the patients who received endocrine therapy failed to respond, and it may be considered that this percentage of prostatic neoplasms are hormone-insensitive.

Determination of the 5 year survival rates was possible in 198 cases; this group was composed of 48 untreated patients and 150 who received stilbestrol. Irrespective of treatment, approximately one-third died within 6 months and nearly one-half died within a year.

When the same series was analyzed in terms of treatment, the significance of estrogen therapy became evident. During the first 6 months 73 per cent of the untreated patients died, whereas only 34 per cent of the patients who received stilbestrol died. After the first 6 months the mortality rates for treated and untreated patients continued almost parallel, but all the untreated patients had died at the end of 36 months, whereas a quarter of the treated ones survived 5 years. It would appear, therefore, that the major importance of estrogen therapy may lie in the suppression of malignant activity during the first 6 months to a year, after which a large number of neoplasms seem to remain controlled or progress comparatively slowly on sustained treatment.

The survival rates at 6 months were better after a higher dosage of stilbestrol in the younger group of patients, whereas no marked difference was noted in the older group. Neither chlorotrianisine (tace) nor phosphorylated synthetic or natural estrogen was superior to estrogen. It was determined with the aid of radioactive stilphostrol that, contrary to expressed opinions, only a negligible amount of estrogen is present in the cancerous tissue.

Adrenalectomy, performed in 19 cases after a relapse from estrogen therapy, has been abandoned by the author. Pituitary irradiation appears to have value in advanced cases.

—*Laurence F. Greene, M.D.*

Testicular Tumors (Les tumeurs du testicule). TOMAS DELPORTE. *Arch. urol. belg.*, 1958, 26: 197.

THE AUTHOR, reporting before the annual Congress of the Argentine Society of Urology in Buenos Aires in December 1957, reviewed the admissions to his urological service for 5 years. During this time he observed 28 cases of tumors of the testicle in 7,000 hospitalizations, an incidence of 0.4 per cent.

This type of tumor is very rare in infancy. Of a group of 239 collected cases, only 4 (1.67 per cent) were found in infants. These cancers are most likely to develop in the age of greatest sexual activity. Thus, 33.89 per cent of the cases were found in patients between the ages of 21 and 30, and 34.72 per cent in those between 31 and 40 years. Although this type of neoplasm has been reported in colored persons, all the cases in this series were found in whites.

As for trauma being of etiologic importance, it is the author's opinion that it was usually a matter of coincidence in drawing the patient's attention to the lesion. The trauma may be a factor in releasing the cells that lead to dissemination. The needle biopsy is rejected as a diagnostic means because of this possibility. The author could associate no more than 6.71 per cent of his cases with trauma.

The side involved by the tumor does not seem to have great significance, except that certain tumors would seem to have a preference for the right side. The chorionic tumors seem to occupy this particular position. When the left side is involved, those tumors subject to hematogenic spread would seem to carry the poorest prognosis because dissemination carried by the spermatic vein ends in the homolateral renal vein. Of 272 tumors for which the side was noted, the right side was involved in 135 and the left in 137. Usually the process is unilateral for until 1955 only 209 bilateral neoplasms had been reported. The author found only one among the 283 cases of testicular tumor he collected.

The incidence of malignancy in ectopic testicles, whether or not they are surgically corrected, varies

between 0.7 per cent and 30 per cent. Thus orchiopexy when the testicle is undescended unilaterally or bilaterally, inguinally or intra-abdominally located, does not remove the risk of subsequent malignant development. Ectopic testicles are organs whose histologic structure remains immature, and whose function remains abnormal. Because of their position they are also more prone to trauma, and to the modifications of pressure and temperature. The author reported an incidence of malignancy of 6.3 per cent in his series.

Of the 283 collected cases, the author presented clinical data on 261 of them. He grouped the cases according to the anatomicopathology of Melicow.

The seminomas constituted the largest group of tumors of the testicle (61.7 per cent) while there were 10 cases of embryonal carcinoma (3.8 per cent). The teratocarcinomas have clinical characteristics similar to the embryonal carcinomas. In this group of testicular tumors, there were 55 or 21 per cent. The adult teratomas can be considered to be, in essence, benign, but at least 5 per cent of them had chorionepithelial elements. There were 17 or 6.5 per cent adult teratomas in the group.

The mixed tumors or associated tumors in the author's statistics represented an incidence of 2.3 per cent, that is, 5 cases of seminoma and teratocarcinoma and 1 case of seminoma and embryoma. The choriocarcinoma is also a rare tumor type, and only 5 cases (1.9 per cent) were reported in this series.

Benign tumors of the testicle are rare. They were not described before 1950 and to date perhaps only 50 have been reported. They consist of the fibromas, chondromas, neurofibromas, and the hemangiomas. The author had only one tumor considered to be a fibroma, an incidence of 0.4 per cent.

The interstitial cell tumors of the testicle are also rare; up to 1956 only 57 cases of this type had been reported. The author had 3 cases of this type, an incidence of 1.1 per cent. With one exception, these tumors were benign. He remarked that castration provoked a regression of symptoms in one third of the cases, improvement in one third of the cases, and no change in the final third. While the process is usually unilateral, 4 cases of bilaterality have been reported.

The treatment of testicular tumor falls into three main categories: the earliest possible diagnosis, histologic determination of the nature of the tumor, and application of the appropriate treatment. The author does not advocate preoperative roentgen therapy for it delays surgical intervention as well as making it impossible to obtain accurate information as to the cellular type of the tumor. He advises the ligation of the cord high in the inguinal canal before the testicle is disturbed in order to avoid, if possible, hematogenic dissemination of the tumor cells. The radical operation leaves much to be desired not only because of technical difficulties, but also, in spite of the low initial mortality, because of the frequent presence of crossed metastases.

In the case of a solitary pulmonary metastasis without apparent dissemination, a lobectomy or a pneumonectomy might be considered. Osseous metastases are rare, but they might be susceptible to large doses of roentgen therapy.

In the presence of disseminated metastases, the remaining testicle might be removed and estrogenic and roentgen therapy administered. Nitrogen mustard, ACTH, and cortisone have been used without marked results.

It is difficult to establish a definite prognosis for the embryonal carcinomas because these tumors contain a variety of cell types and the malignancy depends upon the type of cell. In those containing chorionic elements, the prognosis is extremely grave. Some authors have reported a 53 per cent survival after simple castration and radiotherapy, and Lewis reported 33 per cent good results following the "enlarged castration."

In cases of malignant teratoma and teratocarcinoma, the survival statistics vary between 6 and 43 per cent. In those cases with early metastasis the prognosis is always considered fatal; however, a case has been reported with a 10 year survival after simple castration and roentgen therapy.

In all the statistics, the chorioepitheliomas have been reported as 100 per cent fatal. Since lymphosarcomas are associated with the lymphopoietic system, the prognosis must be considered to be guarded, with an anticipated survival of from 6 months to 3 years in these cases.

The radical operation for those patients who have radioresistant tumors does not have universal acceptance because of the technical difficulties associated with the operation and the possibility of dissemination and cross metastasis to the mediastinum and the supraclavicular nodes.

The author favors simple castration for the teratomas and interstitial cell tumors.

—Conrad A. Kuehn, M.D.

Contribution to the Study of Endocrine Tumors of the Testis: Adenoma of Sertoli's Cells (Contributo allo studio dei tumori endocrini del testicolo: adenoma a cellule di Sertoli). F. CANDELA and P. CANAZIO. *Riforma med.*, 1959, 73: 94.

THE AUTHORS report a case of adenoma of Sertoli's cells occurring in a 45 year old man. This patient noted a very small nontender nodule in the left testis 5 months before hospitalization and when he was examined the nodule had gradually increased to the size of an almond. The growth of the nodule was accompanied by gradual loss of libido and mild enlargement of the breasts. The laboratory findings were unremarkable except for mild albuminuria and increased urinary levels of estrogenic substances and phenolic steroids. Gonadotropins and 17-ketosteroids were normal. (No method is given for any of these tests.)

The testis and the tumor were removed and 13 days after operation, the levels of urinary estrogenic substances fell to normal. The gynecomastia disappeared 10 days after operation. Examination of the specimen showed a testis twice normal size. The normal architecture was distorted and replaced by the tumor except at the periphery. Histologically, the tumor was benign and it was classified as an adenoma of Sertoli's cells or a so-called tubular adenoma of Pick. The article includes a review of the literature and a discussion of the histologic characteristics of these tumors.

—Franco F. Sangalli, M.D.

MISCELLANEOUS

Organic Matrix of Urinary Calculi. Microradiographic Comparison of Crystalline Structure with Microscopic and Histochemical Studies. WILLIAM H. BOYCE, CHALMERS S. POOL, I. MESCHAN, and J. STANTON KING, JR. *Acta radiol.*, Stockh., 1958, 50: 543.

MICRORADIOGRAPHY has extended roentgenography into the realm of the microscope and is reported to give a more reliable depiction of the microscopic detail of bone than did conventional decalcification of and histologic techniques performed on similar sections. This present study was designed to compare microradiograms of untreated calculi with microscopic and histochemical studies of the identical sections after decrystallization to further elucidate the crystal-matrix interrelations in calculi.

The authors studied stones of all types and none was found to be without an accompanying organic matrix, which appears chemically to be essentially the same for all stones. This material apparently originates in the transitional epithelium and appears to be a prerequisite for crystallization. This matrix material is in two physical forms, amorphous and fibrous. Apatite has a peculiar affinity for the fibrous component of the matrix. The fibrous matrix is organized and arranged in concentric laminations, with microscopic aggregates of hydroxylapatite closely adherent to the fibrils. This matrix appears to be a prerequisite to the growth of stones and may influence, or be influenced by, crystal formation to limit the size and shape of stones. Many forces may combine to mold the matrix during the plastic stages: compression from the adjacent calculi, the urinary passages, intermolecular attraction forces, or expansion, mechanical buckling, osmotic forces across the membranes of the matrix, crystal growth, and repulsive forces of oriented molecules.

The mechanism of this matrix formation is unknown but it is intimately associated with the binding of calcium, phosphate, and water ions. This is the initial phase in all calculus formation. As the molecular orientation proceeds, the amorphous gel tends to assume a perfectly spherical shape with regularly spaced laminations formed by the most closely aligned molecules or uromucoid. These laminations act as epitactic stimuli to basic calcium phosphate crystallization. Condensation of these laminations into semipermeable membranes provide a favorable environment for secondary crystallization. As these interstitial crystals increase in size and number there is a commensurate alteration of the uniformity of the laminations. Masses of interlaminar amorphous uromucoid may block crystallization and thus produce "faults" in the orderly arrangement of the crystals. Many extrinsic or compression forces combine with intrinsic or expansion forces to produce the final shape of the fully crystallized calculus. The organic matrix is thus a prerequisite to the concrement formation, and crystal deposition is a secondary phenomenon. —*R. O. Beadles, M.D.*

Statistical and Clinical Observations on the Metastatic Patterns of Tumors of the Kidney, Bladder, Prostate, and Testes (Rilievi statistico-clinici sulla metastatizzazione dei tumori del rene, della vescica, della prostata e del testicolo). FRANCESCO COPPI, LILIANA RIVIERA, and FRANCO CHIEREGO. *Urologia*, Treviso, 1958, 5: 461.

THIS IS a statistical study of 371 primary malignant tumors of the male genitourinary tract, based on the review of 39,240 autopsy records from the Institute of Pathologic Anatomy and the National Tumor Institute of the University of Milan. Tumors of the urethra and penis were not included. Distant metastases (not in direct continuity with the primary tumor) were present in 54 to 64 per cent of the total group.

Renal tumors showed a high incidence of metastases to the lungs, pleura, regional lymph nodes, and liver. Tumors originating in the bladder showed the same metastatic pattern, but the involvement of lymph nodes was far more frequent. The incidence of metastasis to lymph nodes in prostatic tumors was equally high, but skeletal lesions were far more frequent than in tumors of the kidneys or bladder. Lymph nodes, lungs, liver, and kidneys were common sites of metastasis of testicular tumors.

A review of the clinical records of 458 cases of malignant tumors of the genitourinary tract among 9,738 patients admitted to the Department of Urology of the University of Milan showed that clinical evidence of metastasis was detected in only 39 cases (8.5 per cent). This study indicates a great discrepancy in the incidence of metastases in the autopsy group as compared to the clinical group, and the authors suggest a more critical and selective approach to the surgical treatment of malignant tumors of the male genitourinary tract. —*Franco F. Sangalli, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Severe Compression Injuries of the Hand in Industry; Amputation Versus Rehabilitation. MICHAEL L. LEWIN. *J. Bone Surg.*, 1959, 41-A: 71.

INDUSTRIAL COMPRESSION INJURIES are caused by power presses, rotating cylinders, and similar machines. Severe tissue damage is usually encountered. Often such injured hands are considered good candidates for amputation, but whenever possible, reconstruction and rehabilitation are preferable to amputation. Early debridement of the wounds is usually necessary. Devitalized cortical bone should be surgically removed. Joint injuries are usually manifested by necrosis of the periarticular structures with exposure of the joint cavities. The interphalangeal joints usually become ankylosed following such an injury, but the metacarpophalangeal and wrist joints may escape this complication because of their better protection.

Eighty per cent of the severe injuries encountered in this series were on the dorsal surface. The prognosis following dorsal injury is better than that following volar injury because the essential neurovascular supply of the hand is located on the volar surface. In dorsal injures it is often possible to restore a serviceable amount of function if the surviving structures are carefully protected and kept in functional position. In volar injuries of this type, circulatory impairment and damage to important nerves is very likely to end in a painful, frozen, or anesthetic hand.

Following debridement, most of the hands injured in this manner are temporarily resurfaced with split-thickness skin grafts. When cortical bone has been removed, granulations are allowed to form before grafting is done. If infection is present in the granulating areas, wet dressings will usually help to eradicate the infection. The metacarpophalangeal and radiocarpal joints often form deep pockets which require many weeks of splinting and dressing changes before the infection is obliterated.

Following the temporary resurfacing of the injured hand with split grafts, definitive resurfacing with abdominal flaps may be undertaken. Primary application of the flaps to the open wound represents a considerable saving in time and hospitalization and in the number of operations necessary. However, if there is an overlooked focus of infection or necrotic tissue, the primary flap may fail.

Splinting in the position of function was maintained throughout the entire treatment so that by the time treatment was concluded there was a firm bony or fibrous ankylosis of the involved joints. Severely distorted digits often required osteotomy for proper realignment.

Adduction contractures of the thumb were frequently present. Both the cutaneous scar and the fibrosed adductor muscles required excision. Usually a free, thick, split-thickness skin graft or a full-thickness graft was used to cover the denuded area in this location.

Mobilization of the preserved joints consisted of dynamic splinting, active exercises, and occasionally capsulectomy of the metacarpophalangeal joints.

Replacement of missing tendons was instituted from 2 to 6 months after complete closure of the injured extremity. Free tendon grafts were used to bridge the defects in the extensor tendons. Occasionally tendon transfers from the volar surface of the forearm were necessary in cases in which the entire extensor mechanism had been lost.

Aggressive reconstructive and rehabilitating measures were necessary in all of these cases.

—Robert D. Larsen, M.D.

The Rheumatic Hand (La main rhumatismale). M. ZIMMER. *Rev. chir. orthop.*, Par., 1958, 44: 432.

ACCORDING TO the position of the fingers two main deformities of the rheumatic hand are described: the so-called intrinsic plus, also called pill-roller's deformity or retracted hand, that is accompanied by ulnar deviation of the fingers, and the intrinsic minus or claw hand.

The initial lesions originate in the synovial membrane of the joints and rapidly destroy the cartilages and the joint capsules. The intrinsic muscles are secondarily involved and become fibrotic and scarred. An important factor in the production of the deformities is the position of the fibers that unite the tendons of the lumbricals with the extensor tendons of the fingers. When the metacarpophalangeal joints are in flexion, the transversal fibers pulling over the base of the proximal phalanx produce flexion at this articulation. With the metacarpophalangeal joint in extension, however, the transversal fibers slip backward over the metacarpals and their action on the fingers is lost. No flexion of the fingers is then produced.

Although it is assumed by Bunnell that the hyperextension of the proximal interphalangeal joints generally accompanying the intrinsic plus hand is due to contracture of the interossei, the author finds the pathognomonic sign of contracture of the interossei to be missing in these cases; passive flexion of the proximal interphalangeal joint is not possible when metacarpophalangeal joints are forcibly flexed. The hyperextension is explained by the findings at operation. The lateral bands have slipped over the dorsal surface of the phalanx and are united to the medial slip with fibrous tissue. The extensor tendon itself becomes fixed to the skin and to the phalanx. The cause of this is assumed to be a tendinitis accompanying the arthritis of the metacarpophalangeal joints. The ulnar deviation is caused by the inflammation of the metacarpophalangeal joint. The collateral ligaments become loose as well as the fascia at the dorsal surface. The extensor tendons slip laterally. Usually this deformity starts with the fifth finger.

The intrinsic minus or claw hand deformity occurs when the disease initially attacked the proximal inter-

phalangeal joints. (The metacarpophalangeal joints are first affected in the retracted hand.) There is an antalgic flexion of the proximal interphalangeal joints and a reflex contracture of the extensor tendons pulls the transversal fibers proximally, making it impossible for the interossei to flex the proximal phalanx. Often this is followed by a luxation of the metacarpophalangeal joints.

The treatment is essentially conservative and should be started as early as possible. Immobilization in functional position and re-education to re-establish muscular balance are very important. Bivalved casts are most useful. Surgical treatment is used in long-standing cases. For the intrinsic plus hand a tendolysis of the extensor tendon, an arthrolysis of the proximal interphalangeal joint, and eventually Littler's resection of the oblique fibers between the tendon of the interossei and the extensor tendon are carried out through a dorsolateral incision. (A median incision is dangerous for necrosis over the proximal interphalangeal joint develops easily.) When the ulnar deviation must be corrected Bunnell's techniques are used. Arthrodesis of the interphalangeal joints is carried out for deformities of the fingers. In the thumb the metacarpophalangeal and proximal interphalangeal joints are sometimes fused. In intrinsic minus hands a capsulotomy of the metacarpophalangeal joints is performed and completed with a lengthening of the extensor tendon and a plaster cast, keeping the fingers in 90 degree flexion for 10 days. An arthrodesis of the proximal interphalangeal joints is sometimes necessary. When there is a dorsal dislocation of the fingers, the head of the metacarpal must be resected.

—J. C. Mulier, M.D.

Arthrogryposis Multiplex Congenita. NEWTON C. MEAD, WILLIAM C. LITHGOW, and HOWARD J. SWEENEY. *J. Bone Surg.*, 1958, 40-A: 1285.

THIS STUDY is based upon 40 patients who were examined and treated and upon whom close follow-up studies were possible. During a period of 31 years at the Shriners' Hospital for Crippled Children in Chicago, 68 patients with this condition have been treated.

Most of the patients were born after full term pregnancies which terminated with labor of average duration. In a very high percentage (36 per cent) of the patients, birth was by breech presentation and in 3, by footling presentation. It is believed that this is the result of the deformity which obviously could prevent the normal mechanics of birth. It is not likely that this malposition has anything to do with the development of the deformity. The occurrence of the disease in one member of each of four sets of identical twins, 2 of which are in this series, seems to exclude hereditary factors as the cause, and to cast doubt on theories of intrauterine mechanical, circulatory, or toxic causes. The negative family histories further tend to exclude the theory that heredity is a cause. In the postmortem examination there seemed to be no doubt that the number of anterior horn cells is diminished, while the other parts of the cord are unchanged.

Mental deficiency is infrequent in patients with arthrogryposis. When present, it does not appear to be more than coincidental. It is not directly related to arthrogryposis.

There is a strong tendency for arthrogrypotic club-foot to relapse, but the usual management of recurrent club-foot generally succeeds in maintaining reasonably good position and function until the foot has developed and grown sufficiently to allow more radical surgery. Medial soft-tissue release may be necessary in these deformities.

The surgeon should never be satisfied with anything but a good position in these patients since, by osteotomy, he can place the foot in exactly the desired position. Astragalectomy, while not as frequently done as it once was, has given good results in an occasional unstable calcaneus deformity associated with arthrogryposis.

Dislocation of the hip is a common complication of arthrogryposis and is most difficult to correct. Open surgical release of fibrous contractures must be performed if the flexion deformity cannot be released by traction or other simple methods. Even with an anterior dislocation of the hip, the patient can often walk moderately well; this type of dislocation is stable enough to tolerate weight-bearing and is not associated with serious lordosis. The prospect for the achievement of normal function of the hip in these cases is poor.

The knee joint may be flexed with a moderately free range of passive motion but with very little muscle power to control it. The quadriceps may appear to be absent and the patella difficult to palpate or absent. Supracondylar osteotomy may be required for either rotation or correction of rigid flexion deformities.

Rigidity of the elbows in extension or in flexion is the most common problem. Arms in rigid extension are almost completely useless; however, the patient often can use them as crutches to push himself about the crib. To improve function of the upper extremities, it is necessary that at least one hand be able to reach the face. A flexed elbow can be achieved by capsulotomy.

Flexion deformity of the wrist is very common, and is often increased by the patient's habit of supporting his weight in bed on the backs of his hands. Fusion may be necessary.

The smooth, tapered fingers of patients with arthrogryposis have been compared to bent wax candles. They have restricted range of motion and are often moderately flexed. The thumb is often flexed across the palm from which position it can be moved passively but not actively. By replacing the webs with full-thickness skin grafts and by holding the thumbs in functional position by metacarpophalangeal fusion, useful hands may be obtained.

Deformities are difficult to correct and to maintain in correction. Function may be poor because of stiffness or lack of muscle power even when the deformity has been overcome. Stiff joints must be placed in the position of function, and unstable limbs must be braced for weight-bearing. If these things are accomplished, results will be satisfactory.

Excellent photographs and outlines of case reports are given in this informative paper.

—C. Fred Goeringer, M.D.

Aseptic Necrosis of the Patella in Juveniles (Contributo allo studio della necrosi asettica giovanile della rotula). G. PERIA and A. MIRABELLA. *Gior. ital. chir.*, 1958, 14: 775.

THERE ARE certain noninflammatory lesions of the patella which involve either ossification centers or the entire bone and are difficult to classify. Some investigators arbitrarily divide them into 2 groups: the first includes lesions affecting the main center of ossification and is termed "osteopathia patellae juvenilis," and the other is formed by conditions involving accessory nuclei and is called Sinding-Larsen-Johansson's disease.

A 7 year old boy had pain in his right knee and began limping 20 days prior to the examination. His temperature was normal. There was a moderate enlargement of the right knee. The overlying skin was normal; active and passive motions were not limited and were painless. There was no ballottement. Pressure over the patella was very painful. No abnormal findings were present in the left knee. Physical examination of all other areas gave negative results. The radiologic examination disclosed bilateral sclerotic densities of the main ossification centers.

The diagnosis of bilateral aseptic necrosis of the patella was made. Immobilization of the involved areas was instituted and calcium, vitamin D, iron arsenate, and liver extract were prescribed. A follow-up examination 3 months later showed that the patient had made a perfect recovery.

Toxic, hormonal, congenital, traumatic, and vascular factors have been considered by investigators of this subject as playing an etiologic role in aseptic necrosis of the patella. The authors of this article are inclined to believe that vascular disorders are the principal cause of the lesion.

Roentgenographic studies are essential for the diagnosis. Conservative treatment, which is the method of choice, consists of general supportive measures and immobilization of the involved region.

—*Joseph Narat, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Therapy of the Injured Epiphysial Cartilage (Die Therapie der Epiphysenfugenschaedigungen). A. N. WITT. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 289: 361.

GROWTH DISTURBANCES of the epiphysial cartilage may be incited by various factors. Two groups of pathologic conditions may be recognized. The first includes entities such as chondrodystrophy, osteogenesis imperfecta, multifocal endochondral dysostosis, rickets, and renal rickets. Orthopedic therapy consists of osteotomy in the later stages of these diseases, in an attempt to improve the mechanics of the crippled extremities.

The other group includes epiphysial damage due to direct trauma, inflammation, irradiation, and pressure by adjacent tumors. Epiphysial trauma requires immediate therapy, either conservative or, if necessary, surgical to align the cartilage and prevent future deformities or growth disturbances.

Epiphyses damaged by inflammation may cause increased growth, but after total epiphysial plate destruction, growth will cease entirely. Deformities will be most marked if only one of a pair of epiphyses is damaged, as seen in hand deformities when either the ulnar or radial epiphysis suffers damage.

The therapeutic results in conditions as described are not always gratifying. The line of therapeutic approach consists of either slowing down or accelerating the epiphysial growth. The prospective bone growth must be evaluated first, for which the bone growth tables of Green and Anderson have been found to be most useful.

No consistent results were obtained with the multiple procedures introduced for the acceleration of bone growth. Growth arrest may be accomplished by Phemister's or Blount's operation. The first consists of implanting a bone graft. Thompson, in addition, includes curettage of the epiphysial cartilage. The second operation consists of nailing the epiphysial end of the bone with metal brackets; this causes a temporary cessation of growth, which will resume upon removal of the appliance. Wedge osteotomy and epiphysiodesis is indicated if, in addition, a deformity is present.

Extremities may be shortened by removing a bone segment or by implanting such a segment subperiosteally into the contralateral bone if simultaneous lengthening of the opposite extremity is desirable. Lengthening by transverse osteotomy and traction may result in pseudarthrosis.

Benign tumors and juvenile bone cysts, especially if localized close to an epiphysis, should be removed as soon as found. The treatment of choice for femoral head epiphysiolysis is nailing; plaster of paris casts are still preferred in the slow type of the condition. Osteomyelitis of the hip may cause epiphysial destruction and dislocation of the hip. With the aid of antibiotics it is possible to achieve reposition of the newly formed femoral neck into the acetabulum, and a new supporting surface may be developed.

—*Karel B. Absolon, M.D.*

Surgical Treatment of Hereditary Fragilitas Ossium (Zur operativen Behandlung der Fragilitas ossium hereditaria). H. BUCHNER. *Klin. Med.*, Wien., 1958, 13: 541.

FRAGILITAS OSSIUM was described in 1896 by von Spurway as an hereditary condition. The clinical triad of fragilitas ossium, blue scleras, and deafness was reported in 1918 by van der Hoeve. The combination of blue scleras and deafness is less common. Spontaneous arrest occurs toward the end of the second decade. The endosteal and periosteal disease is sometimes connected with joint hypermobility, dental changes, syndactylia, and hemophilia. There are two separate forms: (a) osteogenesis imperfecta letalis (congenital) and (b) osteopsathyrosis, without hearing impairment and blue scleras.

The case of an 18 year old girl with 20 previous fractures whose mother and sister were affected with blue scleras and deafness is reported. A satisfactory cosmetic and functional result was achieved after seven osteotomies of each lower extremity, using intermedullary nail fixation.

—*Ernest H. Bettmann, M.D.*

New Directives for Surgical Treatment of Degenerative Arthritis of the Hip Joint (Neue Richtlinien für die chirurgische Behandlung der Coxarthrose). F. PAUWELS. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 289: 378.

ACCORDING TO PAUWELS, degenerative arthritis of the hip joint is mainly caused by a mechanical disturbance and an insufficient weight-bearing capacity of the cartilage and bone tissue.

Mechanical factors taking part in this process are:

1. Continuous pressure by the muscles (abductors, adductors, and iliopsoas).

2. The intermittent pressure on the joint during gait.

3. The pressure per square centimeter gets higher when the surface on which the pressure is borne gets smaller. This surface diminishes with: (a) subluxations of the femoral head, (b) incongruity of the articular surfaces, and (c) disappearance of the joint cartilages.

There are three ways to change these factors:

1. The pressure of the muscles per square centimeter, which can be very high in inflammatory conditions of the joint, may be diminished.

2. The static intermittent pressure may be diminished.

3. The weight-bearing surface may be increased.

By the technique of Voss (section of the trochantertenotomy of the adductor-muscle), the pressure of the muscles is diminished. This intervention is useful when the patient is unable to withstand more important surgical treatment.

McMurray's abduction osteotomy diminishes the muscle pull and increases, in some cases, the weight-bearing surfaces.

Pauwels' adduction osteotomy diminishes the static intermittent pressure and the muscle pull, and increases the weight-bearing surface. By this procedure the process is not only stabilized but regeneration of the cartilage takes place, as illustrated by many roentgenograms.

The adduction osteotomy is contraindicated, however, when by increasing the varus position the weight-bearing surface of the joint does not increase.

—J. C. Mulier, M.D.

Use of Muscle-Pedicled Cancellous Bone Grafts. JOE B. DAVIS. *South M. J.*, 1959, 52: 24.

THE USE of muscle-pedicled bone grafts in an attempt to transplant a viable bone began with the attempt to transplant the tibia of a living dog to the tibia of a boy. For obvious reasons this failed. Transplantation of the patella on a tendon pedicle for arthrodesis of the knee and transplantation of the trochanter of the femur for hip fusion were similar early examples.

Experimental work on rabbits transplanting cortical bone with and without tendon pedicles indicates that the tendon pedicle did not contribute to the viability of the bone graft. Taylor and Davis, in 1952, transplanted cancellous bone of the iliac crest on pedicles of the fascia femoris muscle. All of these grafts remained viable. Similar experiments transplanting pedicled bone which was then fractured indicated that a muscle-pedicled bone graft retains a sufficient blood supply for the healing of a fracture. Subsequently a portion of the iliac crest was transplanted as a viable bone graft on a muscle pedicle into the forearm. This was performed as a two-stage procedure with the muscle pedicle consisting of the gluteus medius and tensor fascia femoris muscles. Although this transplanted graft appeared to remain viable, amputation of the arm was necessary because of gross malformation.

Subsequently, the author has used muscle-pedicled cancellous bone grafts in hip fusion, in arthrodesis of the shoulder joint, in sacroiliac fusion, and in triple arthrodesis of the ankle joint, all with success. Similar attempts to use muscle-pedicled cancellous bone grafts in lumbosacral fusion were not successful.

—Robert D. Larsen, M.D.

FRACTURES AND DISLOCATIONS

Bennett's Fracture (Sulla frattura di Bennett). T. BUSANELLI and L. TRABUCCHI. *Chir. org. movim.*, 1958, 46: 111.

A COMPREHENSIVE REVIEW of the anatomy, pathogenesis, pathologic anatomy, and radiologic findings in Bennett's fracture is offered by the authors.

Bennett was the first author to call attention to the fact that dislocation or subluxation inevitably follows a fracture of the volar tubercle of the base of the first metacarpal bone.

Two systems of osseous trabeculas in the base of the first metacarpal bone may be distinguished: an anterior, which is very resistant, and a posterior, which has a lacunar space and is the elective site of Bennett's fracture.

At the time of the accident the thumb is strongly flexed and adducted. Contraction of the extensor and abductor pollicis produces the fracture, whereas the action of the adductor and flexor brevis leads to dislocation. The mechanism of Bennett's fracture is similar to that of a fracture of the posterior margin of the lower end of the tibia.

Closed reduction by traction and immobilization in abduction and extension is advocated by numerous authors. Others prefer continuous traction by Kirschner's wire and, finally, there are surgeons who recommend open reduction. Resection of the base of the first metacarpal bone, interposition of a fascial strip, employment of the extensor brevis pollicis, arthrodesis, and many other procedures have been described.

Among 358 fractures of the metacarpal bones treated by the authors, there were 77 involving the first metacarpal bone, 29 of them affecting the joint. Bennett's fracture was found in 20 cases, Rolando's type in 3, Tourneaux-Sarroste's variety in 1, and comminuted fracture in 5.

Bennett's fracture constituted 25.8 per cent of the fractures of the first metacarpal bone and 68.9 per cent of the fractures involving the joint. Of the 20 patients with Bennett's fracture, 16 were men and 4 were women. In 15 cases the right hand and in 5 the left hand was involved. The age of the patients ranged from 17 to 56 years.

Closed reduction by manual traction and immobilization with the thumb in extension and moderate abduction was employed in 19 cases, while in one inveterate case physiotherapy and intensive active and

passive motions were prescribed. Very good results were obtained in 50 per cent of the cases while in the remaining half late functional results were satisfactory.

—*Joseph Narat, M.D.*

Vascularization of Pseudarthroses of the Long Bones, Clinical and Experimental Study (La vascularisation des pseudarthroses des os longs, d'après une étude clinique et expérimentale). ROBERT JUDET, JEAN JUDET, and RAYMOND ROY-CAMILLE. *Rev. chir. orthop.*, Par., 1958, 44: 381.

THE AUTHORS studied some types of pseudarthroses of the long bones, which on roentgenograms are characterized by little displacement and "sclerotic" bone-ends. This dense bone is generally believed to be caused by poor vascularization or even necrosis. Histologically, however, the bone is found to be richly vascular. This finding explains why pseudarthroses of this type unite when a compression force is applied to both ends.

After a discussion of clinical cases, experiments carried out on 14 dogs are described. Nonunion was obtained in these animals, and roentgenograms taken after injection of a radio-opaque solution into the vessels revealed very rich vascularity of the bones, especially around the site of the nonunion, but also of the soft tissues in this region. The fibrous tissue uniting the bone ends was richly vascular, and without inflammatory reaction, degenerated muscle fibers, or ossification uniting both fragments. The bone-ends were the site of important condensation of bone tissue, because of an osteogenic reaction of the periosteum and of the endosteum of the medullary cavity. The density seen on the roentgenograms must be explained by the great number of layers of hyperplastic periosteal tissue and soft tissues.

The findings at the site of the nonunion show how nature tries to unite a fracture in spite of the many factors opposing healing. The authors conclude that a nonunion of this type is not a definitive condition since the bone-ends keep their ability to consolidate if favorable conditions are created.—*J. C. Mulier, M.D.*

Repair in Pseudarthrosis. (Der Heilungsvorgang bei der Pseudarthrose). G. KUENTSCHER. *Zbl. Chir.*, 1959, 84: 49.

CONTRARY TO Lexer, who recommended radical removal of the interposed callus in nonunion, including denuding the bone fragments down to, or including, the periosteum and bone marrow, Kuentscher emphasizes the importance of this fibrous tissue because of its bone-forming properties and mechanical tasks. Since experimental production of a pseudarthrosis is difficult in dogs, the best and most convincing experiment is offered in man, in whom partial resection of the fibula leads to fast healing of tibial pseudarthrosis. When the fibula is resected, the distraction is eliminated and immobilization of pseudarthrosis is better secured. A much better procedure is the introduction of a Kuentscher nail by the closed method through the preserved pseudarthrotic tissues. Failure occurred in the author's series only when Rush pins were used or when the nail was too thin and did not fill out the medullary cavity. The use of long intramedullary drills is essential to open and widen the bone. Recently adjustable, flexible tool attachments have been used which also give fine bone dust that serves as matrix for the new bone. Sometimes the enlargement of the bone cavity from 7 to 14 mm. for a distance of 12 cm. is necessary.

In unreduced pseudarthrosis with lateral displacement and excessive bone deformity, an osteotomy is carried out distally to the area, avoiding damage to the periosteum and eliminating any shearing force on the pseudarthrosis. This procedure makes early movement possible without cast fixation.

Evidently firm coaptation pressure is not necessary. It is concluded that callus is caused mostly by inflammatory processes (chemical, mechanical, or thermal). The necessary stimulation of the living bone cells is best secured when the young bone tissue has complete mechanical rest. The pseudarthrosis gap does not heal if traction, push, or shearing forces, causing catabolic products from the damaged cells, are not eliminated. It is convincingly demonstrated that the interstitial pseudarthrosis tissue should not be removed, since it is absolutely necessary for bone regrowth. The need for a large Lexer or Phemister graft is also eliminated.

—*E. H. Bettmann, M.D.*

Treatment by Bone-Grafting of Aseptic Necrosis of the Femoral Head and Nonunion of the Femoral Neck (Phemister Technique). MICHAEL BONFIGLIO and MAXWELL B. BARDENSTEIN. *J. Bone Surg.*, 1958, 40-A: 1329.

DURING THE PAST 7 years, 53 patients with varying amounts of aseptic necrosis of the femoral head and with or without nonunion of fractures of the femoral neck have been treated by the insertion of two autogenous cortical bone grafts. By means of a two plane roentgenographic control, grafts were placed in the superior anterior quadrant of the femoral head in order to support the part most vulnerable to collapse. Grafts alone were used in those patients with union of the fracture and aseptic necrosis, or necrosis from other causes.

The average hospital stay was 10 to 14 days. During the period from April 1950 to October 1955, 61 patients were operated on at the State University of Iowa Hospitals. An evaluation of 53 patients (55 operations) followed up for 2 years or longer forms the basis of this report. Three classifications were discussed:

1. Minimal to moderate aseptic necrosis of the femoral head with nonunion of the fractured femoral neck. Eleven of the 13 patients in this group had a satisfactory end result.

2. Aseptic necrosis with nonunion. Sixteen of the 22 patients in this group had a satisfactory result. All of the patients had had ununited femoral neck fracture with incomplete replacement of the dead bone of the femoral head as verified by core biopsy. The age of these patients ranged from 38 to 75 years.

3. Aseptic necrosis of the femoral head. Fourteen of 20 operations performed upon 18 patients restored the hip to a satisfactory status. In 17 of the hips two tibial grafts were inserted and in 3 only one graft. These patients had aseptic necrosis of the femoral head with minimal, moderate, or severe collapse of the necrotic area at the junction of living and dead bone.

In most instances the necrosis went undetected until pain heralded the onset of collapse of a necrotic area. In fact, considerable additional delay in treatment usually took place after the onset of pain and collapse. The average time of follow-up after bone-grafting was 4 years. The period of protected weight-bearing ranged from 7 months to 2 years with an average time of 12 months.

There were no operative deaths. The 7 deaths which did occur were from other causes; the earliest at 3 months after surgery. Infection developed in 3 patients; a sinus formed after extrusion of a threaded pin in 1 patient; and an infection developed in 2 patients after reoperation for failure of the bone graft procedure.

Therefore, early application of this biological principle of bone-grafting for nonunion or aseptic necrosis, or both, should lead to better results. This procedure is now being done as soon as roentgenographic evidence of loss of position of fracture fragments, insecure internal fixation, or density changes in the femoral head, indicating aseptic necrosis, is found. The procedure is not advised if the patient is physiologically old or unable to walk with crutches. The results show that the procedure is effective in restoring continuity to the ununited femoral neck fracture, and viability to the necrotic femoral head in a sufficient number of instances to warrant its consideration in the management of these complications.

—C. Fred Goeringer, M.D.

ORTHOPEDICS IN GENERAL

Experimental Retardation of Endochondral Growth by Papain. ANDERS HULTH. *Acta orthop. scand.*, 1958, 28: 1.

THE ENDOCHONDRAL BONE GROWTH of laboratory animals may be disturbed experimentally in many ways. The author's experimental work has to do with the effect of papain, a drug obtained from carica papaya, on endochondral bone growth in young rabbits. A filtered fresh solution of 1 to 3 per cent of crude papain in sterile water was prepared for each series of injections and six litters of young rabbits, varying in age from 21 to 42 days and totaling 34 animals, were used to study the effect of this drug on cartilage tissue. All but one or two rabbits of each litter were used in the experiment, the excluded animals being kept as controls.

The solution was injected into the veins of the ears, and the curling or drooping of the ears after injection was a good indication of the effect of the drug. When used intravenously in young rabbits, the drug results in retardation of the longitudinal growth of bones but does not attack their appositional growth. Also the percentage of weight increase is diminished in comparison to that of litter mates which served as controls. Histologically, a few hours after injection of papain the proliferating cells of the cartilage swell and vacuoles develop within the cells with clumping of the chromatin and poor staining of the nuclei. Twenty-four hours after injection these alterations proceed to the hypertrophic cells in the vicinity of the metaphysis. Two days after injection even the ossification of the cartilage is highly affected, and at this time the changes in the proliferating zone begin to be restored to normal. If repeated injections are given within short intervals severe damage of the epiphysial cartilage occurs, and a visible fibrillation of the intercellular substance—as if the mucopolysaccharides had been washed off—may occur.

The author expressed the opinion that papain probably acts as a proteolytic enzyme and that it also attacks the proteins of the cartilaginous matrix, primarily the mucopolysaccharide protein complex. Irreversible changes could be produced by repeated injections with some of the epiphysial lines in question being completely obliterated.

—Einer W. Johnson, Jr., M.D.

Epiphysial Growth, Clinical and Experimental Studies (Klinische und experimentelle Studien ueber das Epiphysenwachstum). H. KÜHNE. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 289: 350.

INVESTIGATIONS were conducted to elucidate such questions as which epiphysis in the long bones of the extremities is responsible for growth, how does function influence the structure and form of the growing bone, and what role is assumed by juvenile trauma in the development of joint deformities.

A nail was placed perpendicularly through the shafts of the fore and hind legs of 4 week old rabbits; after a period of growth the distance from the epiphysis to the nail was measured on roentgenograms. The experimental results, which corresponded to the clinical impressions, revealed that in the forelegs or upper extremities growth was predominantly at the proximal humeral epiphysis and distal ulnar and radial epiphyses. In the lower extremities or hind legs, the epiphyses of the femur, tibia, and fibula adjacent to the knee joint caused maximal elongation.

Resection of the distal ulna in growing rabbits resulted in lateral deviation of the radius because of the pull of muscle and fascia and the static influence while the extremity was used. This experiment duplicates a deformity of the hand in a 16 year old girl who, at the age of 9 years, suffered a distal radial epiphysial injury. While ulnar growth continued, radial growth slowed down, and a radial deviation of the hand ensued.

Traumatization of the medial epiphysis in the femurs of growing rabbits caused a varum deformity quite similar to one found in 2 patients in whom fracture and osteomyelitis was the inciting cause. Experiments such as these support epiphysiolysis of the medial side as logical treatment for the adolescent valgus deformity of the knee. Femoral condyle fractures must be brought into careful apposition, even if resort to direct methods is necessary. In older patients osteotomy should be tried since improvement in function and stability may be expected in an occasional case.

—Karel B. Absolon, M.D.

Clinical Pathology of the Epiphysial Cartilage (Klinische Pathologie der Epiphysenfuge). L. ZUKSCHWERDT. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 289: 330.

DURING THE FORMATION of the epiphysial nucleus while vessels penetrate its mass, a layer of undifferentiated mesenchymal tissue is displaced between the bone and epiphysial cartilage. The new periosteum is formed by external migration of these cells. Langen-

skiöld believes that chondroplasia is caused by derangement of this process. If such cells form an area of cartilage, endochondral ossification may develop into an exostosis; but in cases of chondromatosis no ossification ensues and the cells grow externally toward the diaphysis.

Marfan's arachnodactyly is associated with a derangement of mucopolysaccharides which may be responsible for the skeletal growth defects and associated anomalies, namely, dislocation of the ocular lens, septal heart defects, and dissecting aneurysms. Some experimentally produced bone conditions are similar to human bone disease, the cause of which remains unknown. Bone changes produced experimentally by administration of a pea plant (Dothyrus odoratus) are like those seen in osteogenesis imperfecta. The osteoblasts in these bones are short-lived and produce a pathologic matrix. Somatotrophic hormones intensify this process and extirpation of the pituitary gland, administration of thyroxin, and hypothermia prevent its development. Metabolic derangements seem to be at play in the polytopic endochondral dysostosis of the Pfaundler-Hurler type, in which lipoid or mucopolysaccharide inclusions appear in the epiphysial cartilage. As no such inclusions are found in chondrodystrophy, this may serve in histologic differentiation.

Rickets may be caused by parathyroid hypertrophy secondary to renal changes, as well as by vitamin D deficiency and other derangements of calcium absorption. A similar clinical picture may develop in beryllium poisoning due to blockage of the phosphatase enzyme system. Although various parts of the nephron may be the inciting or participating element in renal rickets, the resulting effect is hypocalcemia. Administration of high vitamin D doses will decrease the loss of phosphate by activating the renal tubular phosphatase system.

In osteopsathyrosis a poorly ossified matrix develops because of monogenetic damage of the osteoblasts. The osteopoikilia osteocytes produce multiple islands of matrix with the consequence that the osteoclasts are unable to rebuild it. A histologically similar picture may be produced in mice by estrogen administration. In marble bone disease (Albers-Schoenberg) there is disproportion between the organic matrix on the one hand and the minerals and fibrous elements on the other. The situation may be compared to a plaster of paris cast minus the gauze bandage.

Osteitis fibrosa generalisata is characterized by osteoclastic overactivity secondary to hyperparathyroidism. Bone cysts found in this disease have a similar appearance and are perhaps related to juvenile bone cysts; some local factor may be replacing the generalized influence of the parathyroid hormone.

Destruction of the epiphysial plate interferes with growth, as was demonstrated by Ollier in 1888; this work stimulated Phemister and Blount to develop their growth-retarding operations. Heller recently reported the first case of a successful transplantation of the epiphysial cartilage in a human being.

The biomechanics of the growing bone are governed by the following laws: (1) the epiphysis tends to assume a position perpendicular to the pressures exerted, (2) unilateral pathologic pressure causes a growth decrease, while a physiologic pressure produces a growth increase, and (3) increased pressure causes bending and lateral growth.

The hormonal effect on bone growth varies at different ages. Until puberty the somatotropic pituitary effect is predominant and this is augmented by thyroxin. The steroids first stimulate growth but later cause closure of the epiphyses. In the adrenogenital syndrome epiphysial closure occurs at 9 to 10 years of age. Testosterone and estrogens in small doses cause growth and proliferation of chondrocytes, but with high dosage, involution and ossification ensue.

—*Karel B. Absolon, M.D.*

Anatomic Researches in Meniscectomy (Recherches anatomiques à propos des méniscectomies). J. Minne. *Lille chir.*, 1958, 13: 123.

The horizontal incision (transversal type of Dujarier and Braine) results in the section of a sensitive nerve in 75 per cent of the cases (the patellar ramus of the internal saphenous nerve). The vertical parapatellar incision damages the terminal ends of the rami perforantes of the musculus serratus in 60 per cent of the cases or the ramus itself in 40 per cent.

In evaluating 300 cases of meniscectomy performed with the classical transversal incision, it was found that 75 per cent of the patients complained of a painful postoperative period and 33 per cent presented a more or less localized cutaneous anesthesia.

On the basis of this experience and anatomical studies, the authors suggest a new incision for meniscectomy.

—*Marc Verstraete, M.D.*

Coxa Plana, Its Genetic Aspects and Results of Treatment with the Long Taylor Walking Caliper. A Long Term Follow-up Study. R. M. Wansbrough, A. W. Carrie, N. F. Walker, and G. Ruckerbauer. *J. Bone Surg.*, 1959, 41-A: 135.

Two hundred and twelve patients with coxa plana were treated at the Hospital for Sick Children in Toronto, prior to 1950. One hundred and twenty-nine of these patients were traced and re-examined clinically and roentgenographically. One hundred and five of the traced patients were male and 24 were female. Twenty-three patients had bilateral disease and 12 gave a family history of coxa plana. The most common symptoms encountered in this series were limp, limp and hip pain, limp and knee pain, hip pain, knee pain, and miscellaneous symptoms in given order. Examination of early cases revealed spasm of the muscles about the hip with limitation of internal and external rotation and of abduction of the hip with atrophy of the muscles of the thigh and calf. Early roentgenographic changes included increased density of the head of the femur, metaphysial cavitation, lateral metaphysial erosion, and subarticular lines of decalcification. One did not need to wait for flattening or fragmentation of the head of the femur before the diagnosis was made.

Coxa plana is a constitutional disease and is not due to local infection or injury of the hip. In 58 cases there was no precipitating cause, in 47 there was minor trauma, in 6, moderate trauma, and in 15, infection. Twelve patients had relatives who were known to have coxa plana.

Accepted treatment of coxa plana has mainly been directed toward the prevention of weight bearing. Simple bed rest is usually not effective, since few children can be completely prevented from getting up on their hands and knees or from slipping out of bed to walk, unless they are constantly supervised. Ambulation without weight bearing with a Thomas type of caliper was used at the Hospital for Sick Children until 1930. Subsequently, the Taylor type of caliper with a high shoe on the normal side was used and found to be more satisfactory. For patients with unilateral coxa plana, the splint was used throughout the course of the disease. The patients with bilateral coxa plana were first treated with bed rest until one hip was sufficiently well healed to allow weight bearing. A special stool was constructed which allowed the child to sit down without removing the caliper. This facilitated the school attendance of the child. Frequent re-examination and frequent roentgen examinations were performed. The splint was worn until regeneration of the diseased bone was complete.

The results were evaluated as excellent, good, fair, and poor, with two methods of classification. The method of Heyman and Herndon was used to measure the anatomic deformity of the femoral head and neck, and the acetabulum. The method of Levy and Girard also took into consideration the presence or absence of pain, the degree of limitation of motion, and the shortening of the affected extremity. The age of the patient at the time of the onset of the disease had a marked effect on the end result. In children under 5 years of age, only excellent and good results were obtained. In children who were more than 10 years of age at the time of onset, there were no excellent results. The stage to which the disease had advanced at the time treatment started had a marked affect on the result. No known form of treatment will correct a flattened or disintegrated femoral head. The duration of the symptoms, however, did not always indicate the stage to which the disease had advanced.

A comparison of the results in this series with those of series treated by other means showed that the long Taylor walking caliper produced just as satisfactory results as prolonged bed rest in splints. Prevention of weight bearing by any means gave a much better result than that obtained without any treatment.

When the disease had been diagnosed early, about 28 months of treatment was required before regeneration was complete. If the disease was diagnosed late and fragmentation had occurred, 3 to 5 years of treatment was necessary.

Twenty patients had poor or fair results. Twelve of these had far-advanced disease before treatment was started. The remaining 8 patients with fair or poor results seemed to have obtained these results because of poor cooperation. Perhaps greater surveillance would have improved the results in the latter group but it is doubtful if any method of treatment can give an excellent result if the child is determined to bear weight on the affected limb.

In spite of marked residual deformity of the femoral head, patients are often able to continue well into middle life without serious disability. Among the 129 patients, hip fusion was necessary for the relief of pain in one; another patient required an arthroplasty of the hip. Five other patients had enough disability to interfere with their work. The true incidence of osteoarthritis following treatment for coxa plana can only be assessed by study of a group of patients who have reached the fifth, sixth, or seventh decade of life.

—Robert D. Larsen, M.D.

Emergency Treatment of Injuries Resulting from Traffic Accidents; Lesions of the Spine and the Extremities (Traitement d'urgence des accidents de la route; Lésions du rachis et des membres). R. MERLE D'AUBIGNÉ. *Acta orthop. belg.*, 1958, 24: 97.

AFTER A DESCRIPTION of the first aid to be given at the roadside and in the hospital to patients with serious injuries after traffic accidents, the author emphasizes some lesions in which early diagnosis and treatment are extremely important.

Fracture-dislocations of the cervical spine may be caused by hyperextension and require immediate immobilization by a cervical collar as described by Rogers, and reduction by skull traction. If closed reduction is impossible, open reduction must be performed under local anesthesia, and the reduction held by wire fixation of the vertebrae. In dislocations caused by extension, quadriplegia is sometimes found with no loss of sensibility. Traction is the best treatment.

When there are lesions of the dorsolumbar vertebrae, the author is very conservative. Most patients are treated without a cast and fusion is almost never necessary. Exercises are begun immediately after the accident. In case of paraplegia a laminectomy is never useful unless progressive signs of medullary compression appear within the first days after the accident, which is extremely rare.

Dislocation of the hip joint with a fracture of the posterior wall of the acetabulum is a new lesion created by automobile accidents. Very often this lesion remains unrecognized, especially when accompanied by fractures of the femoral shaft. A routine roentgenogram of the pelvis is insufficient and oblique films should be taken. The luxation must be reduced immediately by powerful skeletal traction on the femur with the hip in 70 degree flexion. Necrosis of the head develops in 30 per cent of the cases reduced within 24 hours, and in 100 per cent of the cases reduced after 24 hours. When the dislocation is unstable an open reduction with internal fixation must be performed.

A fracture of the femoral shaft may be complicated by a fracture of the neck of the femur or a dislocation of the hip joint. Open treatment is usually necessary. Comminuted supracondylar fractures of the femur are treated by skeletal traction. In fractures of the tibia on two levels, balanced skeletal traction-suspension is very useful as a primary or definitive form of treatment.

—J. C. Mulier, M.D.

Dangers and Errors in the Use of Prostheses in Bone and Joint Surgery (Fehler und Gefahren der Alloplastik in der Knochen- und Gelenkchirurgie). H. BÜRKLE DE LA CAMP. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1958, 289: 463.

IN THE first part of this article the author discusses the dangers of metallic and plastic prostheses, especially as used for the hip joint. Not only are some of them

toxic to the tissues, and even possibly carcinogenic, but the best tolerated metallic materials, such as vitallium and V 4A steel, may break because of fatigue. Although the author thinks that plastic prostheses are better tolerated because of their slight elasticity and the thick layer of fibrous tissue in the joint cavity, they wear out rapidly. Many prostheses have had to be removed recently, some of them after 1 or 2 years, because of pain and mechanical failure. It is believed that no further progress can be made with plastic or metallic prostheses. Therefore, the author has used autogenous tissues for arthroplasties during the last 3 years.

In the treatment of fractures, also, one should be much more conservative, especially with intramedullary nailing. Nailing should be performed only in selected cases and not as a routine procedure. The procedure should be technically perfect.

The author has treated 160 cases of nonunion and 53 cases of osteomyelitis which occurred after Küntscher nailing in the last 7 years.

—*J. C. Mulier, M.D.*

Primary Fibrosarcomas of the Skeleton (I fibrosarcomi primitivi dello scheletro). I. F. Goidanich and R. Venturi. *Chir. org. movim.*, 1958, 46: 1.

Forty-three cases of primary fibrosarcomas of the skeleton, selected from 2,506 cases of surgically treated primary and metastatic neoplasms from the archives of the Rizzoli Institute, University of Bologna, Italy, are discussed.

In classifying these new growths the authors have excluded fibrosarcomas arising from the fascia, muscles, blood vessels, and nerves, which only invade bone secondarily. The selected cases have been classified in two ways, from the standpoint of the histological findings for prognosis, and from the standpoint of the roentgenological findings for therapy.

The histological classification divides the fibrosarcomas into types, the first including those similar in appearance to the simple fibroma and presumably the most benign; the remainder are classified according to the degree of immaturity, and, presumably, increasing malignancy. This classification is essentially that of Broders' (four types) as modified by Calandriello (*Arch. Putti*, 1954, 4: 343).

In the last classification adopted by the authors there are three types indicating progressively increasing malignancy. Broders' second type is included in types I and III since there is no sharp distinction between these groups, and because the histologic picture does not always indicate the degree of malignancy and the prognosis.

The roentgenologic classification possesses greater value than the histologic, both as to prognosis and therapy. This classification depends upon the anatomopathologic findings and follows that of Calandriello who distinguishes three roentgenographic varieties of fibrosarcoma, endosteal, periosteal, and parosteal. In the first variety, the tumor arises in the medullary canal and expands toward the periphery; in the second there is a localized erosion of the periosteum; in the third there is a tumor of the soft parts and the bone is involved only secondarily. Although the roentgenogram may show these differences there are transitional forms and it may not be possible to assign a specific tumor to one or the other group.

The authors add to the above classification a group which includes rarifying (osteolytic) and sclerosing (osteogenetic) fibrosarcomas. They disagree with Phemister who asserted that fibrosarcoma does not produce bone tissue and contend that on the basis of the histologic findings the production of osteoid tissue can be ascribed to the tumor tissue. The trabeculae of newly formed bone tissue are enveloped by the connective tissue fibers of the tumor stroma, and in the immediate vicinity of the trabeculae the fibrous stroma undergoes a gradual transformation in which the fibrillary component becomes progressively differentiated and finally completely replaced by a homogeneous substance.

The authors conclude that the most important therapeutic indications are given by the clinical behavior of the lesion. Initially every effort should be made to avoid a destructive operation. If possible the tumor focus should be curetted out and the resultant cavity filled with bone chips, especially if the tumor exhibits the histologic picture of low grade malignancy. Since recurrences are known to become more malignant and with repeated recurrences metastases eventually appear, radical excision should not be unduly delayed.

—*John W. Brennan, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Pathologic Anatomy and Physiology of Peripheral Circulatory Disturbances (Pathologische Anatomie und Physiologie der peripheren Durchblutungsstoerungen). G. HOLLE. *Zbl. Chir.*, 1958, 83: 2113.

THIS ARTICLE is a review of the author's theories with regard to the pathogenesis of arteriosclerosis and of thromboangiitis obliterans. The walls of arteries are complex biochemical, neuromuscular, and mechanical systems. They can easily be disturbed and they react in different ways, even when the etiologic factor is the same or similar. The changes may be functional or anatomical. Functional changes always affect the metabolic activity of the artery. The pathologic changes which can be produced, however, are limited, and they vary with the site of the injury. There are several basic reactions which take place. The accumulation of lipoid material is one of the most familiar of these reactions and is known to take place in children and young adults. The properties and concentration of blood lipoids determine, to some degree, the occurrence of this lesion. The presence of a beta-globulin-bound beta-lipoprotein in the blood seems to predispose to lipoid deposition in the arteries. It is not uncommon to have arteriosclerotic changes begin as a proteinaceous edema of the intima which may lead to sclerosis and accumulation of lipoid material. The author and his associates have studied the mucopolysaccharide content of the vessel wall and have found that the pepsin-liberated fraction increases until the age of 30, at which time less of it is found. This is taken to signify a stronger bond of the muccopolysaccharide to the collagen fibers and an increasing inability of the ground substance to hold calcium and lipoids in solution.

Thrombotic and inflammatory changes of the intima also are basic responses to injury in the blood vessel.

The author considers thromboangiitis obliterans and arteriosclerotic obliterans as different entities and points out that the former may be complicated by the latter. Both diseases, however, are expressions of a basic derangement of the ground substances within the vessel wall. —*J. C. Rosenberg, M.D.*

A Simple Technique for Endarterectomy. HARVEY R. BUTCHER, JR. *Surgery*, 1958, 44: 984.

THE AUTHOR has designed a stainless steel wire loop which in his hands has proved a simple and effective method of carrying out endarterectomy under some circumstances. The technique of preparation of the wire loop is given in detail and the article is illustrated by sketches showing its method of use.

This technique has been used to remove the diseased intima of the entire external femoral and upper popliteal artery, the common femoral and external iliac arteries, the common iliac artery, and the abdominal aorta. Caution is made that one should not attempt blind endarterectomy at points of major arterial bifurcations such as those of the common iliac and common femoral arteries because of the danger of occluding important pathways of blood flow such as the hypogastric and deep femoral vessels. The advantages of this method of endarterectomy may be summarized as follows:

1. No specially designed instruments are required.
2. The open loop of steel wire is in part adaptable to moderate changes in arterial size because of its flexibility.
3. The method is easily and rapidly executed; it minimizes discontinuous irregular intimal dissection and the number of arteriotomy incisions. The uniform cleavage plane developed by the wire loop is illustrated. For details regarding the method of preparation of the loop, the technique of use, and the results, the original article should be studied.

—*Gordon Madding, M.D.*

A New Method of Artery Graft Anastomosis. JOHN T. PHELAN. *Surgery*, 1958, 44: 990.

THE AUTHOR'S PURPOSE was to describe an artery graft anastomosis applicable to a bypass procedure which approximates the intraluminal orifice profile of the arteries that originate from the aorta and its pelvic branches. The method of investigation consisted of examination of 10 abdominal aortas, including the pelvic branches, during postmortem examination. After these specimens were studied, an artery graft anastomosis was carried out in 10 adult mongrel dogs. As a comparison, a study employing a similar number of animals was made using an end-to-side anastomosis as recommended by Linton. All animals were sacrificed at the end of 30 days, and of the 10 grafts in which the conventional type of end-to-side anastomosis was employed, only 2 were patent. In that group in which the author's method had been used, 5 of the 10 grafts were found to be patent. The article includes an artist's conception of the technique employed and photographs showing the trap-door graft anastomosis in an experimental animal.

—*Gordon Madding, M.D.*

The Surgery of Traumatic Arteriovenous Fistulas and Aneurysms. CARL W. HUGHES and EDWARD J. JAHNKE, JR. *Ann. Surg.*, 1958, 148: 790.

AT THE WALTER REED ARMY MEDICAL CENTER during the past 7 years 202 patients with 215 traumatic arteriovenous fistulas and aneurysms were treated. Most of these patients sustained their injury during the first two years of the Korean War. There were twice as many fistulas as aneurysms. The vessels of the head and neck were involved in 11.1 per cent, of the upper extremity in 32.6 per cent, and of the lower extremity in 56.3 per cent. Eighty-one lesions involved only minor vessels and in these lesions, ligation and excision were adequate. This report is concerned mainly with the 134 lesions that involved major vessels.

Early in the series 30 patients were treated by quadruple ligation and excision. Operation was delayed 3

months to allow collateral circulation to develop. Preoperative sympathectomies were done when earlier operation became necessary because of pressure symptoms or danger of rupture. No limbs were lost in this group, but in many patients arterial insufficiency developed which was not improved by subsequent sympathectomy. Therefore, a policy of restoration of major vessel continuity was followed in the remaining cases. Direct anastomosis was done in 61, vein graft in 17, artery graft in 6, lateral repair in 4, division of the fistula in 10, and in 6, operation was not done because of spontaneous closure of the fistula.

Follow-up studies were available on 76 patients or 57 per cent of the patients with major vessel injuries. In general, patients who complained of pain at rest, coldness, swelling, and claudications had multiple injuries. The lower extremity was symptomatic more often than the upper extremity. Fifteen patients had changed their occupation because of their injury, and of these, 11 had vessels ligated. Of the 11 patients who felt their results were poor, 10 had had ligation procedures. The vein grafts were found to be functioning quite satisfactorily without dilatation over a 5.5 year period. Not enough data were obtained on the patients with arterial grafts to draw any conclusions. In arteriovenous fistulas there was swelling of the extremity in every case when the vein had been ligated which emphasizes the importance of repairing the vein as well as the artery. —*George R. Holswade, M.D.*

The Treatment of Arterial Obliterations of the Sclerotic Type (Progrès récents dans la thérapeutique des obliterations artérielles du type sclérotique. Contribution expérimentale préliminaire à l'étude du mécanisme pathogénique de l'artériosclérose). R. FONTAINE. *Ann. chir.*, Paris, 1958, 12: 1203.

SEVENTY-ONE EMBOLECTOMIZED PATIENTS have been controlled for periods of from 1 to 9 years. Eleven were operated upon for obliteration of the common iliac artery, 7 for obliteration of the external iliac, 45 for involvement of the superficial femoral, 7 for involvement of the popliteal, and 1 for involvement of the humeral artery. Six patients died at the time of operation or soon afterward; 14 died later as a result of advance of the arteriosclerosis or of other ailments.

In 32 of the 49 living patients the obliterative process recurred more or less rapidly following the operation. Recurrence of the obliteration, provided it does not develop too suddenly, may be compatible with a satisfactory clinical result.

In 239 patients grafts or vascular prostheses were used. Eighty-three were venous autografts, fresh and aseptically procured, 140 conserved arterial homografts, and 16 alloplastic prostheses. In 96 patients the obliteration was the result of wounds, subcutaneous ruptures, posttraumatic and postembolic thrombosis, and arterial and arteriovenous aneurysm. The results were excellent, but these cases are not considered here.

In the 143 patients in whom the obliteration was the result of arterial processes the results were not so brilliant. In 4 cases involving the bifurcation of the aorta the patient did not live beyond the first postoperative year despite good immediate results. In 2 patients in whom an ivalon prosthesis was used rapid reobliteration took place. In 83 of the remaining 137 patients, fresh venous autografts were used and in 54 conserved arterial homografts. The vessels obliterated were the iliac artery in 23 cases, the femoral artery in 107, the popliteal artery in 6, and the humeral artery in 1.

At the time of this evaluation, 93 of the 137 patients were still alive. In 71 of these 93 the thrombosis had recurred, in 22 the graft was still permeable. The fresh venous autografts were successful in 18 per cent of 143 cases, and the conserved arterial homografts in 24 per cent.

Of 30 cases in which an arteriovenous shunt was performed 2 have not reported and 1 was operated upon very recently. Four died soon after operation, 17 were not benefited, in 5 the extremity was saved. Three of the last group are still living after 5, 6, and 7 years, respectively; 2 died after 3 and 5 years, respectively.

The author reviews briefly the experimental work which he has been carrying on with Mandel. It has been shown that the capillaries of the vasa vasorum of the arteries extend through all the layers of the arterial wall as far as the endothelium, as do the fibrils of the vegetative nervous system. The author believes that the conditions leading to atherosclerosis result from metabolic disturbances in the arterial wall, disturbances developing on a neurovegetative basis. The work done by O. F. David, Ph. D. Oester, and B. Friedman (*Circulation Res.*, 1955, 3: 374–376) supports this hypothesis. —*John W. Brennan, M.D.*

BLOOD; TRANSFUSION

Safety of Liquid Plasma—A Statistical Appraisal. W. A. SAYMAN, R. L. GAULD, S. A. STAR, and J. G. ALLEN. *J. Am. M. Ass.*, 1958, 168: 1735.

THE AUTHORS report the experience at the University of Chicago Blood Bank with respect to viral hepatitis among patients who received transfusions of plasma and/or whole blood between September, 1942 and January, 1957. There were 433 infusions of plasma only, 1,242 infusions of plasma plus blood, and 2,343 infusions of blood only. Plasma from 28 to 30 donors was pooled and after testing for bacteriologic contamination was stored in fluid states for 6 months at a temperature from 76 to 96 degrees F. (24.4 to 35.5 degrees C.).

Among 305 patients who survived 180 days or longer after the transfusion of plasma, not a single case of hepatitis was noted. The expected rate of hepatitis was 48 cases if plasma had not been processed as described. Among the 653 recipients of both blood and plasma 21 cases of hepatitis were observed. The expectancy for this group was 123 cases, 24 of which could be ascribed to the amount of blood which was transfused.

The authors conclude that there is very little chance that pooled liquid plasma will produce serum hepatitis after being stored approximately 6 months at an average temperature of 89 degrees F. Provided adequate bacteriologic safeguards are used to ensure sterility this procedure will enable the preparation of pooled plasma that is essentially free from the risk of transmitting serum hepatitis. When temperatures are at a lower range (22.4 degrees C. or 72 degrees

F.) serum hepatitis can be transmitted despite a 7 month period of storage. Daily temperature records are, therefore, essential to the safety and success of the procedure used. The proteins of plasma so treated are not disturbed sufficiently to affect their usefulness in the treatment of hypovolemic shock or hypoproteinemia and there has been no clinical evidence that this product is antigenic. —*Allan D. Callow, M.D.*

Hemorrhage and Massive Transfusion. A. W. ULIN, SEYMOUR GOLLUB, H. S. WINCHELL, and E. W. EHRLICH. *J. Am. M. Ass.*, 1958, 168: 1971.

A NEW SYNDROME called "hemorrhage due to massive transfusion" has been described as associated particularly with the large transfusions sometimes necessary in modern surgery. It has been ascribed to thrombocytopenia, fibrinolysin, and multiple clotting defects by different groups. Thirty-eight patients receiving massive transfusions at Hahnemann Hospital in Philadelphia formed the basis of the present study. Twenty-two patients underwent open heart surgery and did not bleed while 8 patients who underwent open heart surgery did have a hemorrhagic episode. Eight patients underwent closed heart surgery and had a hemorrhagic episode. Those patients who bled from mechanical causes are excluded from this definition.

No obvious preoperative differences between those who bled and those who did not were seen. The authors attempt to answer the question of the relationship of the bleeding to the size of the transfusion. The amount of blood received varied from 2,000 to 21,000 c.c. and was usually given during a period of 24 hours or less. The authors conclude that, in the patients studied, massive transfusion may have been necessary, but was not sufficient in itself to produce hemorrhage; the large volumes of blood given to bleeders were given in greatest measure, if not entirely, because of the hemorrhage, and thus were a result rather than a cause of hemorrhage. The thrombocytopenia that was seen in some patients was ascribed in part to dilution of the patient's blood with platelet-poor transfusion. Insofar as the effect of plasma or platelets is concerned, the authors conclude that there was no difference between bleeders and nonbleeders in platelet values and in the plasma coagulation system. No common cause of bleeding was found and the authors' final conclusion based on 16 bleeders in 38 patients who received massive transfusion is that massive transfusion was not sufficient in itself to produce hemorrhage.

—*Allan D. Callow, M.D.*

RETICULOENDOTHELIAL SYSTEM

Radiation Injury and Marrow Replacement: Factors Affecting Survival of the Host and the Homograft. JOSEPH W. FERREBEE and E. DONNALL THOMAS. *Ann. Int. M.*, 1958, 49: 987.

THE AUTHORS state that exposure of the entire body to ionizing radiation in the range of 500 to 1,000 roentgens is followed by death in 7 to 14 days. Failure of marrow function followed by bleeding and septicemia is the primary cause of death. In a number of animal species death in this manner can be avoided by the intravenous infusion of homologous marrow cells a day or two after exposure to radiation. Infused marrow cells locate in the marrow of the irradiated subject and divide, multiply, and restore marrow function in time to save life. Preliminary clinical work suggests that similar phenomena occur in man.

In our present understanding of the immunology of homografts two newly recognized basic biologic phenomena have appeared. The first is Billingham's principle of "actively acquired tolerance," a phenomenon which in many respects is the opposite of immunity. The second is the discovery of radiation chimeras, i.e., an animal may bear cells with different genotype, cells of different hereditary chromosomal origin as, for example, a homograft of marrow following lethal irradiation. The individual's lymphoid immunologic mechanism, that is, his defense system, when mature, distinguishes his tissue from that of outsiders. Some marker denoting "self" is on his molecules. The mature lymphoid tissue recognizes this difference and reacts to it with rejection of the graft. In early neonatal or fetal development when the pattern of immune responses is not yet established, it may be possible to induce a change in the usual pattern reaction to induce tolerance and to prepare for subsequent successful homograft reception. Tolerance may extend beyond permanent growth of the tissue used to induce tolerance and may embrace future acceptance of other tissues of the same donor. The reason for this may be that the important antigens of homograft immunity are constituents common to all cells of a given individual and presumably are a direct reflection of its genetic chromosomal constitution. This fortunate universality of the determinant antigens allows successful transplantation of other organs once tolerance to a single tissue has been established.

In some species tolerance can be induced by injecting a new born animal with a few marrow cells from a prospective donor. Lethal irradiation may also destroy the immune reaction. The dose of irradiation given may be sufficiently uniform and intense to destroy all mature lymphoid tissue and with it all patterns and means of immunologic defense rendering the individual capable of tolerating a homograft. These are the broad outlines of the radiologic approach to successful homotransplantation: lethal irradiation, life-saving marrow transplantation, and then homografts as desired from the marrow donor. These animals, however, remain immunologic cripples prone to death from intercurrent infection unless carefully watched in healthful surroundings and treated with antibiotics. The marrow transplant, however, may continue to function well. Adult spleen or lymph node tissue may not be added to marrow infusions as a remedy for lymphoid replacement because these adult lymphoid cells have a mature pattern of immune reaction and are not tolerant of the defenseless irradiated host. They react against host tissue antigens and when administered in more than the minimal number usual in adult marrow tend more to destroy than to repopulate the lymph nodes and splenic follicles in which they lie. Injections of fetal hematopoietic material appear innocuous as far as immediate effect is concerned.

In the treatment of leukemia total body irradiation and marrow replacement are attractive. The procurement and preparation of human marrow are simple. Intravenous injections with proper precautions appear to be harmless. Marrow, however, has shortcomings when used as a material for restoring lymphoid defenses after irradiation. A potential remedy in the form of fetal lymphoid tissue is possible, but the restoration of lymphoid defenses and the management of infection in the irradiated subject are difficult and require further exploration. The problem of appropriate radiologic facilities deserves immediate attention. —*Allan D. Callow, M.D.*

MISCELLANEOUS

The Inadequacies of Routine Bleeding and Clotting Times. Louis K. Diamond and F. Stanley Porter. *N. England J. M.*, 1958, 259: 1025.

To be worthwhile, routine laboratory tests should give a maximum of information unobtainable by simpler methods, should be inexpensive and easy to perform, and should be accurate and yield reproducible results. The authors clearly show that the routine determinations of bleeding and clotting times done before operation to screen out patients who are "bleeders" fail to do this.

Three groups of patients were analyzed. The first included patients who had routine bleeding and clotting times done in an outside laboratory prior to surgery. The results of one or both of the tests were reported to be abnormal, and the patients were then referred to the Research Hematology Laboratory of the Children's Medical Center for further evaluation. There were 9 such patients. None had any familial or personal history suggestive of a bleeding disease, and physical examination was not remarkable in any. In no case was a demonstrable coagulation defect or bleeding tendency found.

The second group was comprised of patients who bled after operation but in whom coagulation tests gave entirely normal results. There were 8 such patients. None had a history suggestive of bleeding previous to their operation, and all had negative physical examinations.

The third group of 19 patients consisted of those with definite hemorrhagic disease but with normal clotting and bleeding times. Twelve of these patients had classic hemophilia and 7 of them had Christmas disease (deficiency of plasma thromboplastin component).

The clotting time is usually determined by the Lee-White or by the capillary tube method. Considerable variation from the normal is encountered even in the best regulated laboratories, and in children the procedures are complicated by technical difficulties in obtaining a good venipuncture. There are many objections to the capillary tube method and the authors have found the method totally inaccurate. Blood from an ear lobe or the forearm is usually used to determine the bleeding time. The use of the forearm is better because the results are reproducible and it is difficult to apply effective pressure to the ear if severe bleeding occurs.

The group 1 cases demonstrate that false positive reactions do occur; however, it is of particular importance that none of the children involved had a history or physical finding suggestive of a bleeding disease. The group 3 patients demonstrate that patients with a definite disease, such as hemophilia or Christmas disease, can have normal bleeding and clotting times. The history and physical findings of the patient with severe hemophilia are quite obvious, but the situation is different in patients with mild forms of the disease, and routine bleeding and clotting times without additional tests also fail to identify such patients. The group 2 patients simply show that patients can bleed during and after surgery and not have any demonstrable coagulation defects.

As alternatives for routine bleeding and clotting times, which in no way fulfill the criteria for useful routine tests, the authors believe that the taking of a pointed and accurate familial and personal history and a careful physical examination are far superior screening procedures. They have yet to see a patient with a congenital coagulation defect who did not have a significant history suggestive of this by the time that he had reached the age of 2 years. Excessive bruising, hematomas after trauma or injection, excessive bleeding from cuts, bleeding after surgery, bleeding into joints, and bleeding from the genitourinary and gastrointestinal tracts are historical points which should be sought. If the history or physical findings are sufficiently suggestive, a complete battery of coagulation tests should be done. Only acquired diseases are not excluded by the aforementioned procedures, and it is possible for the patient to have a thrombocytopenic purpura of mild degree without significant findings or history. Because of this a peripheral blood smear for platelets is strongly recommended at the time that routine hemoglobin and white blood cell counts are made. —*E. Thomas Boles, Jr., M.D.*

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

The Principles and Technique of Resection of Soft Parts for Sarcoma. LEMUEL BOWDEN and ROBERT J. BOOHER. *Surgery*, 1958, 44: 963.

NO TYPE OF NEOPLASM is more indifferently treated in surgical practice than is the sarcoma of soft tissue origin. This fact is explained by the infrequency of the tumor and by the unfamiliarity of many surgeons with the characteristics and behavior of these neoplasms. Amputation is accepted by most men as the treatment of choice for sarcomas of the extremities. While in no sense intending to deprecate amputation as a means of treatment in certain situations, the authors submit a method of surgical treatment which is consistent with the natural behavior of these tumors and in addition satisfies the tenets of good cancer surgery, and which obviates in selected instances the loss of an extremity. The recommendations are based upon experience in the management of 36 such tumors obtained by the authors either directly in their own practices or indirectly in the wards and clinic of the Mixed Tumor Service of the Memorial Hospital in New York.

Depending upon the anatomic location of the sarcoma adequate surgical treatment may require amputation in certain instances or may be accomplished by extensive resection of the soft tissues in other instances. There is a natural tendency to perform small operations for relatively low grade tumors and extensive operations for the highly aggressive ones. A local procedure will often be advised for a fascial fibrosarcoma while a radical exarticulation will more likely be advised for the highly malignant synovial sarcoma. Such histologic criterion for the choice of surgical procedure is at present unchallenged but according to the authors, is unfounded on the basis of known results. Exception to this opinion has been expressed by Ghormley.

The authors believe that the criterion for the choice of surgical procedure should be the gross anatomic setting of the tumor. An extensive resection of soft tissue should be carried out for a sarcoma regardless of the histogenesis when complete removal of the tumor and its surrounding muscles, fat, fascia, and skin can be readily accomplished. Amputation should be performed for a sarcoma, regardless of histogenesis, when, because of proximity to bone, joint, or principal vessels, the tumor cannot otherwise be adequately removed. Thus, even a small sarcoma arising around the wrist will probably require amputation while a much larger sarcoma arising in the muscles of the midthigh may be adequately resected with preservation of the leg.

The authors emphasize that extensive resection of soft parts is not applicable to all sarcomas of soft parts. However, when a sarcoma is so situated anatomically that wide removal of the tumor can be carried out as described, amputation of the involved extremity may not be necessary. The authors present the thesis that the gross anatomic setting of the sarcoma and not its histologic type should be the primary criterion in determining whether amputation or extensive resection of soft tissue be employed for accomplishing adequate treatment.

Sarcomas of soft parts are characterized by an absence of true encapsulation, by filamentous extension within muscle fasciculi and along contiguous fascial planes and nerve trunks well beyond visible and palpable tumor, and by occasional metastasis by way of the lymphatics. If local treatment is to be carried out with the hope of success it must, therefore, be aggressive. When resection of soft parts is anatomically feasible for the removal of a sarcoma, it should include wide ablation of surrounding grossly normal tissue, removal of entire muscle bundles at points of origin and insertion, employment of sharp dissection throughout, minimal handling and massage of the tumor, and proximal ligation of major venous tributaries early in the procedure.

Case reports with sketches and photographs are given to support the recommendation of the authors.

—*Gordon Madding, M.D.*

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Injuries to Flexor Tendons of the Hand in Children. JOHN L. BELL, MICHAEL L. MASON, SUMNER L. KOCH, and WILLIAM B. STROMBERG, JR. *J. Bone Surg.*, 1958, 40-A: 1220.

THE AUTHORS present their experience with 60 children who sustained tendon injuries or combined tendon and nerve injuries of the flexor surface of the hand. In children, this type of injury is most commonly caused by broken glass or other sharp objects, such as metal, knives, or razors. More than 50 per cent of the children treated were less than 6 years of age.

Eight children with wounds sustained less than 6 hours prior to hospitalization were treated by primary repair.

Secondary procedures were performed between 4 weeks and 6 years following injury. Thirty-four patients had tendon grafts within the digital sheaths of the fingers. In 20 of these cases, the preoperative condition of the digit was considered good since there were supple joints, soft minimal scars, and no major trophic changes. Sixteen of these 20 patients were operated upon within 3 months after the initial injury. None of these children had undergone primary tendon repair. Seven cases having this type of tendon graft were classified in the scar group, because of hypertrophied skin scars or a deep cicatrix that limited passive motion of the digit. Five hands were classified in the articular group because of limited passive motion at the interphalangeal joint due to previous bone or joint injuries, and two hands were classified poor because of bilateral neurovascular lesions, extensive scarring, and marked limitation of passive joint motion. Of the 14

patients in these latter groups (scar, articular, and poor), 6 patients had primary tendon repairs performed, and only 4 were operated upon for repair of divided tendons within 3 months following injury.

Of the 7 children having tendon grafts of the thumb, 5 had division of the flexor pollicis longus tendon without injury to the branches of the median nerve. The thumb joints were supple, with minimal scarring.

Fifteen children had secondary repair of tendons and nerves in the palm and wrist. Six of these patients sustained flexor tendon injuries in one digit proximal to the digital sheath. Eight children had severe injuries near the transverse carpal ligament and sustained multiple nerve and tendon damage. These children had impaired intrinsic motion of the thumb.

Operation was performed in a bloodless field by means of an inflated blood pressure cuff, and fine nonabsorbable suture was used exclusively. Divided flexor tendons were repaired according to the technique described by Mason. In cases in which tendons and nerves were divided in the region of the carpal tunnel, the nerves and profundus tendon were repaired, but the sublimis tendons were excised, and the transverse carpal ligament was not repaired.

The long extensor tendons of the toes were used as a source for tendon grafts. The distal attachment of the graft was made just proximal to the insertion of the profundus. A small triangular area of periosteum was removed from the bone, and the graft placed against the bared bone and overlapped by a short stump of profundus. Fine silk sutures were used to unite the profundus insertion to the underlying graft. In the palm, the proximal portion of the graft was sutured to the profundus tendon at the origin of the lumbrical muscle by pulling the graft through the profundus. A slight overcorrection of the normal posture of the digit was the guide in determining the tension of the graft.

Postoperatively, the child's hand was flexed at the wrist and the digits were moderately flexed by a compression dressing and an aluminum splint. In children less than 6 years of age, casts were applied, extending above the elbow. The hands were immobilized 3 to 3.5 weeks following tendon and nerve reconstruction. In younger children, sutures were removed on the seventh postoperative day under general anesthesia. In the 60 patients, one postoperative infection occurred in a hematoma of the palm following secondary suture of nerves and tendons.

Of the 34 children having tendon grafts in fingers, 28 were followed up long enough for evaluation. Twelve excellent and 9 good results were obtained.

Five excellent and 2 good results were obtained following the insertion of long tendon grafts of the thumb. Follow-up studies on 13 of 15 children operated upon for secondary repair of nerves and tendons of the palm revealed 6 results considered excellent and 6 considered good. The success of tendon reconstruction varies directly with the preoperative condition of the hand.

—*Stuart L. Scheiner, M.D.*

Dispensability of Postoperative Penicillin in Septic-Hand Surgery. JOHN ANDERSON. *Brit. M. J.*, 1958, 2: 1569.

THE PURPOSE of the work reported was to evaluate the common use of penicillin after operations upon septic lesions of the hand. The study was restricted to localized infections only and attention was directed principally upon the rate of healing of abscess cavities after the evacuation of pent-up pus.

All patients required surgery and were treated as out-patients, and children under 10 years of age were excluded. The patients were placed without bias into one of three categories:

1. Those treated with surgery alone
2. Those treated with surgery and penicillin given orally
3. Those treated with surgery plus penicillin (depot)

At operation swabs were taken from the exposed infected tissue for culture and sensitivity tests with penicillin and erythromycin.

The criteria of healing were a dry, completely epithelized wound, full function of the affected member, and no need for further dressings or attendance. The healing time was a number of days between the operation and final discharge.

All patients were seen both preoperatively and postoperatively, although, some of the operations were done by colleagues with agreed uniformity of procedure.

The postoperative care of 357 patients with sepsis of the hand was studied. From this certain observations were made:

1. Routine postoperative administration of penicillin does not hasten healing in septic lesions of the hand which require surgical treatment, provided that a careful technique is based upon anatomically accurate diagnosis.

2. Penicillin has been safely excluded from the postoperative environment of uncomplicated acute infections of the hand, and this may be a more fundamental counter to the emergence of the resistant organisms than recourse to other antibiotics.

3. The author concluded that web abscess and threatened infection of the structures that move or support the hand are the only firm indications for chemotherapy, which will not act as a cover for misdiagnosis or inappropriate surgery.

—*Gordon Madding, M.D.*

Treatment of Burns, Preliminary Report (Traitement local et général des brûlures, Note préliminaire). J. LORTHIOIR, JR. *Acta chir. belg.*, 1958, 57: 659.

THE AUTHOR is concerned primarily with the deep second degree burn in which the surface epithelium is destroyed, but deep epithelial islands of the hair follicles and cutaneous glands are preserved. These cases form the majority of those hospitalized for burns. These burns result from a rather brief contact with spilled boiling water, burning clothes, explosive liquids, or corrosives. The epithelial remnants are destroyed rapidly, usually in the first few days.

Burns with total destruction of all epithelium, such as electric burns or those resulting from a more prolonged contact with the caloric agent, were not included in this study.

Local treatment was aimed at a complete debridement of the burned area with the aid of a rotary disc of 25,000 r.p.m., similar to that used by dermatologists in the treatment of acne or tattoos.

Immediately on admission, the patient was taken to the operating room where, under general anesthesia, the burned area was washed and then abraded until it began to bleed slightly. It was then dressed with sterile gauze. The area was redressed in 3 to 4 days and in 20 days, epithelization was complete.

The wounds were only slightly painful and dressing them did not require anesthesia. There have been no infections and no keloids. Fluid loss has been minimized. None of these cases has needed grafting. In true third degree burns, the abrasive process is continued until subcutaneous fat appears. Granulations appear soon, and the wound can be grafted about the fifteenth day if its extent warrants it.

Two patients had burns of 80 and 90 per cent of the body surface, respectively. They were given the aforementioned local treatment. Renal and electrolyte problems were less severe than with the usual form of treatment. The author attributes this to decreased absorption of broken down proteins. To help manage the systemic "vascular and sympathetic troubles," the author administered procaine intravenously in sorbitol. Saline is contraindicated and glucose inactivates the procaine. Antibiotics, 50 mgm. of cortisone, and 1.5 gm. of potassium chloride were given orally.

The amount of plasma required in the patient with the 90 per cent burn was reduced from the calculated 9 liters to 500 to 750 c.c. during the first 24 hours, followed by 2,000 c.c. of sorbitol-procaine solution. Urinary excretion, with normal specific gravity, was only 200 c.c. the first day, 600 c.c. the second, and 1,800 c.c. the third. Microscopically, there were no casts and but few red and white cells.

After 24 hours, the dressings were removed, and the patients lay naked on sterile sheets with a cradle over them. After the second day, the patients were given a liquid diet. A tracheotomy is recommended to allow sucking out of the bronchial tree.

One patient died of ventricular fibrillation on the twelfth day. At autopsy the usual picture found in burned patients was absent. The kidneys were neither edematous nor fatty, the liver was grossly normal. Microscopically, there was no degeneration of the glomeruli nor necrosis of the tubules; neither was there any liver necrosis, although fatty infiltration was found in places. The adrenals showed depletion of lipids—a picture of stress, but the organs still appeared able to function.

There were 22 other less extensive cases with good results. —*L. S. Cherney, M.D.*

The Nuclear Weapon Explosion and Its Effect on the Treatment of Soft Tissue Wounds. WILLIAM H. MONCRIEF, JR. *Surg. Clin. N. America*, 1958, December, p. 1453.

THE RESOLUTION of the problem of soft tissue injury and wound treatment after the detonation of a nuclear weapon has not yet been achieved conclusively. The study reported by the author represents the most authoritative information on the subject today.

The initial concept of battlefield debris being hurled into soldiers by the blast wave from a nominal weapon has had to be modified. Extensive studies have been carried out evaluating the blast-pressures needed to penetrate the chest and abdominal wall of laboratory animals. When the over-pressures that are required to give momentum to debris are integrated with the amount of radiation that the individual would receive at the same distance from the nominal weapon's detonation, it is found that the subject has been exposed to lethal levels of radiation. If one moves away from the weapon to sublethal radiation levels, one is still within blast perimeters that would hurl fragments of glass and small objects with little inertia with such force that the exposed individual would incur superficial wounds and lacerations. From the studies made of the medical record from Hiroshima and Nagasaki it was noted that in individuals with sublethal "radiation sickness" the wounds would become exudative and necrotic. Fourteen days following the explosion the patient became quite weak. Up to this time small incised wounds had healed normally, but thereafter a wound which was still unhealed became worse and remained incompletely healed for a number of months.

After extensive study of laboratory material and the clinical data from the Japanese casualties, it appears possible to predict the course of wounds compounded by whole body irradiation from the hematopoietic response of the patient. With the pancytopenia that follows radiation the individual loses one of the principal barriers to infection. In addition, the immune mechanisms are severely impaired or essentially abolished with the higher levels of radiation. Because of the loss of these defenses, the radiated and wounded individual must depend more on the intact epithelium as a barrier than on the ability to immobilize and destroy the invading organisms.

Wounds of such a nature that their edges coapt themselves soon after occurrence heal uneventfully except in those individuals who have received lethal levels of whole body radiation. An avulsed or abraded wound that does not lend itself to early closure will eventually heal in an individual who has received a significant level of radiation, but the wound goes through a state of retrogression which coincides with the hematopoietic response to radiation. If the patient does not succumb to his radiation or its complications, the wound will heal. It is during this period that the danger of systemic bacterial invasion via the open wound becomes a distinct possibility. In those individuals who have received a lethal dose of radiation, if their wound edges are brought together within 24 hours of injury, there is every reason to believe that these will remain closed until the terminal stages. It is in the debrided wound (the open wound) that, with the systemic response to radiation, there is literally progression of the wound, the granulations becoming anemic, edematous, and gangrenous.

After evaluation of all of the available information it appears that large numbers of explosive, high velocity wounds and crushing injuries requiring debridement in the classical sense will not be encountered following nuclear weapon detonation. The greater number of wounds will be lacerations and abrasions and can be cared for in a "minimum care" treatment unit. The few wounds of this type which surgeons may encounter can be debrided with the methods developed in World War II and the Korean War. Those wounds that have had to be debrided will be a

problem, however. In the past the ideal time for secondary closure of the debrided wound has been thought to be from 4 to 7 days after debridement. From laboratory studies and study of the Japanese clinical data it appears that to carry out a secondary closure of the wound at this time—a time when the systemic response to whole body radiation is at its beginning maximum—would definitely be harmful, and probably fatal. The patient with the debrided or avulsed wound will have to have definite surgery postponed until he has recovered from his radiation effects, which may be anywhere from 3 to 8 weeks after injury.

The best available guide for treatment of wounds in individuals exposed to nuclear irradiation will be the hematopoietic response to radiation.

—*Gordon Madding, M.D.*

Study of Staphylococcic Infections Occurring on a Surgical Service. M. L. Koch, Derward Lepley, Jr., C. M. Schroeder, and M. B. Smith. *J. Am. M. Ass.*, 1959, 169: 99.

In order to evaluate simple semi-isolation techniques as a means of controlling the spread of cross infection, two 60-bed general surgery wards were selected, one as a study ward, and the other as a control ward. One end of the study ward was divided from the ward proper, and this area was established as an isolation unit. All patients who were admitted with infections, and those who developed infections in the study ward were placed in this area. Nasopharyngeal and rectal cultures were made on a monthly basis on the personnel and staff of these two wards and the operating suite, and whenever possible on patients on admission, prior to surgery, and on the fourth postoperative day. In cases of infection cultures were obtained until the infection had subsided.

During the one year study period, 74 patients acquired hospital infections caused by coagulase-positive, phage-typable staphylococci; contacts were established in 42 of these cases. A slightly greater number of patients in the total group and in the cross infection group were located in the study ward. Fifty-one patients acquired their infection postoperatively, with resulting over-all infection in 4 per cent. The staff and personnel carrier rates were not significantly different on either ward or in the operating suite; however, the fecal carrier rate was almost as high as the nasopharyngeal carrier rate, and some individuals were simultaneous carriers. Eleven individuals, distributed evenly among the wards and the operating suite, were persistent carriers, harboring staphylococci of the same phage pattern for a minimum of 5 consecutive months.

There was no significant change in the rate of incidence of staphylococci resistant to the three tetracycline drugs following a withdrawal of their use for a period of 8 months. Of the hospital-acquired infections, the great majority were caused by eight commonly occurring staphylococci as determined by phage pattern. Five of these phage patterns were associated with almost all the cases of cross infection. These commonly occurring patterns were, in addition, associated with admission infections. A close correlation existed between the phage patterns of staphylococci cultured from patients with hospital-acquired cross infections and those exhibited among the staff and personnel carriers. Only one in-patient carrier played a role in cross infection. Emphasis is placed upon the point that had the search for carriers been based solely on nasopharyngeal isolations, 31 per cent of the carriers in this study would have been overlooked, since they were fecal carriers. Since 65 per cent of the in-patient strains and 55 per cent of the carrier strains were drug resistant, the acquisition of these strains by the carrier group is largely a matter of their availability within a given area.

Strict practice of asepsis should therefore lower the carrier rate and decrease the number of cross infections due to resistant staphylococci. Patients having open cutaneous lesions represent a real hazard as a source of cross infection on surgical wards. The mean hospital stay was prolonged by 24 days in patients sustaining cross infection of postoperative wounds. Moreover, the staphylococci of the predominant phage pattern involved in such cross infections are endowed with enhanced powers of communicability, infectivity, and resistance to the antibiotics in common use.

—*Stuart L. Scheiner, M.D.*

ANESTHESIA

Complications of Endotracheal Intubation. William Hamelberg, C. M. Welch, John Siddal, and Jay Jacoby. *J. Am. M. Ass.*, 1958, 168: 1959.

Because the technique of endotracheal intubation is so valuable, this study was conducted to determine the frequency with which intubation results in complications and whether the incidence of complications can be decreased. Since one of the principal actions of hydrocortisone is the reduction of edema and inflammatory reaction, it was postulated that this substance might be useful in preventing the complications which follow endotracheal intubation.

Complications occurring after endotracheal intubation for general anesthesia were studied in 1,932 patients. In the first group, comprising 322 patients, hydrocortisone was used in a 1 per cent concentration in a 5 per cent lidocaine hydrochloride ointment; this was applied to the endotracheal tube before insertion. In the second group, comprising 670 patients, a 2 per cent solution of hydrocortisone in isotonic sodium chloride solution was used. Two cubic centimeters of this combination were instilled into the trachea prior to the removal of the endotracheal tube and 3 cubic centimeters sprayed into the oral pharynx with a No. 15 atomizer. In each group control studies were carried out with the use of a similar ointment (734 patients), or isotonic sodium chloride solution (206 patients) without the addition of hydrocortisone to the treatment regimen.

No serious complications occurred in any of these patients. Among those patients who had no predisposing causes for symptoms, complaints referred to the throat were spontaneously mentioned by 28 per cent of the patients. Questioning elicited such complaints from an additional 17 per cent. No significant difference was found between the patients who received hydrocortisone and those who did not.

—*Mary Frances Poe, M.D.*

Suppression of Cyclopropane-Epinephrine Arrhythmias in Dogs by Four Phenothiazine Derivatives. MARTIN M. WINBURY, LORRAINE M. HAUSLER, JOANNE K. WOLF, MONROE J. KELIN, and W. M. GOVIER. *Anesthesiology*, 1958, 19: 743.

THE PRESENT STUDY compares the effectiveness of perphenazine, chlorpromazine hydrochloride, promazine hydrochloride, and mepazine in preventing the arrhythmias resulting from epinephrine administration to dogs under cyclopropane anesthesia. Epinephrine challenges were started after a 45 minute period of equilibration on 16 per cent cyclopropane. The epinephrine solution was infused intravenously at a content rate of 3 micrograms/kilogram/minute until the appearance of multiple ventricular ectopic beats. The compounds under study were injected intravenously after a consistent end point for epinephrine was obtained. Dose levels of 0.1, 1.0, or 5.0 mgm./kgm. were studied in individual animals.

Certain doses of these compounds were effective in preventing the development of multiple ectopic beats and afforded some degree of protection against cyclopropane-epinephrine arrhythmias. These phenothiazine derivatives also produced reversal of the hypertensive effect of epinephrine, but there was an important distinction in the dosage of compound required to block these two actions of epinephrine. In general, perphenazine was the most active compound in protecting dogs against cyclopropane arrhythmias; promazine had 30 to 50 per cent of the activity and mepazine 2 to 10 per cent of the activity of perphenazine. The order of effectiveness among the compounds appears to be related to the order of adrenergic blockade based on "reversal" of the pressor effect of epinephrine. —*Mary Frances Poe, M.D.*

Myocardial Irritability: Pharmacodynamic Control by Mepazine (Pacatal) in Dogs. GUNTER CORSSEN, G. W. N. EGGERS, JR., ERNST GADERMANN, MAURINE GIESE, and CHARLES R. ALLEN. *Anesthesiology*, 1958, 19: 733.

IT WAS THE PURPOSE of this investigation to determine the protective effects of mepazine on the heart under cyclopropane anesthesia when epinephrine was injected.

Dogs were anesthetized with a mixture of 33 to 35 per cent cyclopropane in oxygen. After the animals had rebreathed the anesthetic mixture for 30 minutes, epinephrine in a concentration of 0.005 mgm./kgm. was injected intravenously in approximately 4 seconds. One week after the controls were run, the procedure was repeated following the administration of mepazine in divided doses 125, 25, and 5 minutes prior to the administration of epinephrine. The occurrence of either ventricular or auricular extrasystoles was considered a significant epinephrine effect. Without mepazine, this technique consistently produced significant disturbances of cardiac rhythm. In the dogs given mepazine, there was either complete absence of arrhythmias or a reduction in both their severity and frequency. Simultaneous studies of the arterial blood pressure were carried out in 7 of the test animals. In 5 of the 7, following mepazine administration, a brief and transient fall in systolic blood pressure (average 23 mm. mercury) occurred. The blood pressure raising power of epinephrine was not significantly impaired by the presence of mepazine.

The protection against the epinephrine effect which was observed with mepazine in the dogs in this series is explainable by the specific depressant effect of mepazine on the conduction system in the heart.

—*Mary Frances Poe, M.D.*

Fluothane: A New Nonexplosive Volatile Anesthetic Agent—Preliminary Report on 2,000 Administrations. HOWARD M. AUSHERMAN and ANIBAL ADAN. *South. M. J.*, 1959, 52: 46.

FLUOTHANE was used as the principal anesthetic agent for 2,000 unselected patients of all ages. It was adaptable to well-known techniques of anesthesia.

The advantages of fluothane are several. It is nonirritating to the respiratory tract, it inhibits salivary and bronchial secretions, it is not unpleasant to inhale, induction and recovery are rapid, it is nonexplosive, it is very potent, it can be used with soda lime, it causes diminished bleeding at the surgical site without extreme hypotension, and it can be used as a reversible hypotensive agent. Respirations can be controlled easily, and there is less postoperative vomiting, and only a small incidence of postoperative hypotension and shock when this agent is used.

Its disadvantages are that it may cause arrhythmias, it produces only moderate relaxation, it is incompatible with epinephrine, and it depresses the respiration and the cardiovascular system.

—*Mary Karp, M.D.*

Promethazine Hydrochloride in Surgery and Obstetrics. M. H. ADELMAN, ELLIOTT JACOBSON, P. A. LIEF, and S. A. MILLER. *J. Am. M. Ass.*, 1959, 169: 5.

THIS STUDY is an evaluation of promethazine as a premedicant drug, as an antiemetic agent, and as a sedative during spinal anesthesia. It involved the use of promethazine in 4,300 surgical patients and 700 obstetrical patients.

Preanesthetic medication with promethazine and scopolamine and reduced doses of meperidine affords optimal sedation without significant respiratory and circulatory depression. It practically eliminates nausea and emesis in both the preoperative and operative periods and markedly reduces these symptoms in the postoperative period. The induction and maintenance of anesthesia are facilitated. It should be a valuable adjunct in regional anesthesia for effective sedation without respiratory depression, tachycardia, or hypotension.

In obstetrical patients promethazine effected excellent amnesia and analgesia, minimized nausea and emesis, and produced no maternal depression and no fetal depression. Side effects appeared rarely. These included restlessness, bizarre athetoid type movements, localized muscle twitchings, and moderate hypotension. —*Mary Karp, M.D.*

Balanced Analgesia for the Poor-Risk Patient Undergoing Thoracic Surgery. C. C. SANTOS and R. B. SWEET. *J. Am. M. Ass.*, 1958, 168: 1977.

BALANCED ANALGESIA, in brief, is simply anesthesia minus true hypnosis. This is a report of another technique for balanced analgesia which was developed

at the University of Michigan Hospital and used on 100 poor-risk patients undergoing thoracic surgery. The types of operative procedure carried out in this series comprised major cardiovascular as well as pulmonary and esophageal surgery.

During the preoperative interview, reassurance and the providing of rather detailed information of the anesthetic procedure relieved most of the patients of their anxiety and apprehension.

Premedication consisted of an adequate oral dose of pentobarbital sodium given the evening before; another dose of the same drug was given 2 hours before the induction of anesthesia. A moderate dose of morphine sulfate and scopolamine was administered by the subcutaneous route one hour before the induction of anesthesia. Topical anesthesia of the larynx and tracheobronchial tree was obtained either transtracheally along with the simultaneous administration of 100 per cent oxygen or transorally by means of a spray immediately before intubation. Meperidine hydrochloride in a 1 per cent solution was given intravenously in 10 mgm. dosage increments until signs of partial analgesia developed. Induction was carried out with thiamylal sodium given intravenously in a 2 per cent solution administered intermittently in 20 to 40 mgm. doses to the point of mild hypnosis. A 40 mgm. dose of succinylcholine in a 2 per cent solution was given intravenously to accomplish a fast and atraumatic oral intubation. From this point on, respiration was continuously controlled until the chest was completely closed. A gas mixture of oxygen 1.5 liters flow and nitrous oxide 3.5 liters flow was used. A continuous drip of 0.2 per cent of succinyl choline was used to prevent the initiation of possible dangerous reflex cardiac arrhythmias from operative manipulations inside the chest. Ten cubic centimeters of a 1 per cent lidocaine solution were infiltrated into the hilum of the lung on the operative side to eliminate bucking on the endotracheal tube consequent to surgical manipulations and compression of the lung.

Postoperatively the patients were totally amnesic for the events during the entire operative period including the state of partial analgesia. In the 8 deaths in this series, no direct cause and effect relationship between mortality and analgesia was found. In general, the postoperative course was short, uneventful, and relatively free of any complications considered significant.

In summary, the authors emphasize that this complex technique is not for the novice. For the experienced anesthesiologist, this method of analgesia affords protection to the patient against disturbances of physiological balance. —*Mary Frances Poe, M.D.*

Safeguards in Clinical Hypothermia. (Text in Russian). *Khirurgia*, Moskva, 1958, p. 11.

INDICATIONS for hypothermia in cardiovascular surgery are being more and more limited by the development of the method of extracorporeal circulation.

The author reports the results of biochemical studies on 46 adult patients who underwent cardiac operations under hypothermia in the surgical department of Banting's Institute in Toronto, Canada.

Three problems must be confronted when this method is used, namely, shock during restoration of normal temperature, intensified response of ventricles to stimulation, and tendency to bleeding.

The operating room should not exceed 22 degrees C. Icebags, applied to the patient's body, are covered with a blanket. A cooling fluid, deriving from a refrigerating machine, circulates through the coils of the blanket.

The author registered the esophageal and rectal temperatures, made electrocardiograms, and determined the *p*H of the blood in the course of refrigeration and rewarming. He has reached the following conclusions:

Shock, occasionally observed during the rewarming period, is apparently provoked by metabolic acidosis and can be avoided by the employment of chlorpromazine hydrochloride, promethazine, and meperidine hydrochloride, or by supplementing nitrous oxide and relaxing drugs with ether. The vasodilating effect of ether maintains peripheral circulation on the proper level and thus prevents acidosis. Furthermore, the use of hypotensive drugs is superfluous when ether is employed, and the author now prefers this method to the use of lytic mixtures.

Heparinized blood is preferable to citrated blood because it reduces the frequency of irreversible ventricular fibrillation.

Hypothermia is accompanied by acutely developing but reversible thrombocytopenia. Intravenous injection of heparin in the incipient stages of hypothermia prevents this phenomenon which is responsible for the bleeding tendency.

In a series of 46 cases 6 fatal outcomes could possibly be attributed to hypothermia.

—*Joseph Narat, M.D.*

Control of Generalized Hypothermia Induced by Refrigeration (Le contrôle de l'hypothermie généralisée provoquée par réfrigération). F. SAGEESSER, J. L. RIVIER, CHS. HAHN, B. BAUDRAZ, and Others. *Helvet. med. acta*, 1958, 25: 255.

THE PURPOSE of refrigeration is to reduce the basal metabolism and thus the oxygen consumption in order to suspend the circulation long enough to permit a short intracardiac operation. Many surgeons have abandoned the method as being too dangerous, although a few have used it successfully when very precisely indicated. Swan reported 84 cases of intra-auricular communication and valvular stenosis in which no operative mortality was encountered. Hypothermia can yield good results only if properly controlled. The multiple complex physiologic disturbances involved are difficult to understand and control. The basic prerequisites for efficient control include control of ventilation by careful blood studies, and control of the cardiocirculatory changes due partly to cold and partly to interruption of the circulation. Disturbances of the metabolism due to cold and substitution of controlled ventilation for spontaneous respiration demand a constant control of the respiratory exchanges in order to maintain the acid base balance and the ionic equilibrium within fixed limits. During the period of chilling, oxygen consumption, and carbon dioxide production fall conjointly and progressively, and artificial ventilation must be applied to prevent the *p*H, CO_2, pCO_2, and electrolytes from departing too far

from normal levels. Contrary to Dutch authorities, it is unnecessary to look for alkalosis in this period. Alkalosis at this time is not significant.

Once the chest is opened, however, and the surgeon prepares to interrupt the circulation, alkalosis is essential to prevent the fall in *p*H that follows arrest of the circulation. Clamping of the vessels from 4 to 8 minutes in hypothermia results in an average drop of *p*H of from 0.10 to 0.20 units. It is best, therefore, to induce artificial hyperventilation 15 minutes before clamping so that the arterial *p*H is increased to 7.60 when the circulation is interrupted. Even transitory acidosis is one of the main causes of ventricular fibrillation at low temperatures, especially in procedures involving direct manipulation of the heart. Correct and rapid estimations must be reported immediately from the laboratory to the operating room which necessitates the collaboration of an assistant in charge of hypothermia and the aid of a trained biochemist.

The effect of hypothermia on cardiovascular conditions was observed in 15 animals; there was a pulse rate of more than 80 per minute in 9 cases, less than 80 per minute in 5 cases, and a stationary level in 1 case. In 12 cases, the arterial pressure dropped from 150 to 90 mm. Hg. The electrocardiogram showed an increase of 7/100 sec. of the P-Q space in 2 instances and of 1/100 to 2/100 in the other cases. The duration of the QRS was frequently increased by 2/100 to 3/100 sec. The QT interval is always increased in bradycardia. As a rule the rhythm remained sinusal. In one case there was a period of nodal rhythm and in 2 instances there were transitory auricular fibrillations. The chief risk in hypothermia is ventricular fibrillation. In 4 such cases defibrillation was achieved in 3 instances after 15, 17, and 60 minutes, respectively. —*Edith Schanche Moore.*

SURGICAL INSTRUMENTS AND APPARATUS

A New Type of Vessel-Suturing Apparatus. KIYOSHI INOKUCHI. *Arch. Surg.*, 1958, 77: 954.

IN ORDER TO overcome some of the difficulties associated with manual vessel suture, such as thrombosis at the anastomosis, the consumption of too much time, and the apposition of small vessels, the author has devised a vessel-suturing apparatus simpler in construction than those previously described by Androsov and Gudov of the Soviet Union. The apparatus consists of two main parts: paired bushings with carrier-forceps and a pair of laterally attached hemostatic clamps. The paired bushings are known as the "clipping bushing" and the "supporting bushing." Each bushing is composed of two half-bushings which meet when the forceps are closed. U-shaped clips, located in the clipping bushing, are driven out into the supporting bushing by a pushing-comb. When the clips are received in the supporting bushing, their legs are bent in the form of a B in corresponding holes. The clips are made of alloyed steel, and each set of apparatus is equipped with a dozen bushings in graduated caliber, each with its own carrier-forceps.

At operation, the hemostat clamps are placed on each side of the future anastomosis, and appropriate half-bushings are fitted to the vessel end. The vessel end is everted and fixed around the bushing with the fixing clamp. The same procedure is performed on the other vessel end. The two bushing clamps are approximated, the clipping lever is pressed to actuate the pushing comb, and a water-tight anastomosis is completed.

The extent of intimal injury with this apparatus when evaluated by the adsorption of P^{32} labelled platelets onto the anastomotic portion of the intima appears to be less than that occurring following manual suture. The clips induce little local reaction, and the suture line is concave on its intimal aspect when examined long after anastomosis. The author alludes to numerous animal experiments and some clinical experience with this apparatus, but no data are included in this report. —*Stuart L. Scheiner, M.D.*

Bypass for Open Heart Surgery. CHARLES K. KIRBY, STANLEY GIANELLI, JR., HARRISON MCMICHAEL, JOHN C. SCHUDER, JAMES S. MCCAUGHAN, JR., and JULIAN JOHNSON. *Arch. Surg.*, 1959, 78: 193.

WHEN VENOUS PRESSURE was maintained below 10 cm. of water during the experiments reported in this article, the amount of blood within the animal increased as the perfusion rate was increased. This was the result of an automatic shift of an equal quantity of blood from the extracorporeal to the intracorporeal portion of the perfusion circuit. There appeared to be a characteristic blood volume for a given perfusion rate during an entire experiment in each animal, as evidenced by a return of the intracorporeal and extracorporeal volumes to original levels even after stabilization at other levels associated with both slower and faster perfusion rates had been observed.

The stability of the animal's blood volume when the perfusion rate was kept constant was further tested by removing measured quantities of blood from the femoral artery or transfusing measured quantities into a femoral vein. It was not possible to decrease or increase the animal's blood volume by bleeding or transfusing in this manner because an automatic compensatory shift of almost exactly the same amount of blood into or out of the extracorporeal circuit occurred promptly. This relative constancy of the blood volume at a given perfusion rate in spite of deliberate attempts to increase or decrease it by transfusion or "hemorrhage" appeared to provide a reasonable basis for control of the blood volume in patients undergoing open heart surgery with the aid of total cardiopulmonary bypass.

The authors have used this method in more than 30 patients and have found it to be reliable within certain limits. Conditions which seemed essential for successful clinical application of this method were maintenance of a low pressure (less than 10 cm. of water) and constant arterial perfusion at a rate approximately equal to the patient's resting cardiac output. A Kay-Gaertner modification of a given type of vertical screen oxygenator was used in all clinical perfusions.

In the face of catastrophic hemorrhage and after technical accidents leading to an ineffective heart beat and unduly long perfusion, the correlation between the blood replacement through oxygenators with the blood loss became difficult to evaluate be-

cause repeated periods of partial perfusion slowed up the perfusion rate on total bypass on account of lack of enough blood and similar factors. Levophed appeared to contract the size of the vascular tree as expected, forcing blood into the extracorporeal circuit and profoundly altering the reflex mechanisms responsible for automatic blood volume control.

The authors caution that they make a reservation regarding the total length of time for which the relationship of low venous pressure, constant perfusion rate, and constant blood volume may hold true. Recent experiments suggest that after 30 minutes there may be a tendency toward the transfer of more blood from the oxygenator to the patient than can be accounted for on the basis of blood loss.

—*Allan D. Callow, M.D.*

Cerebral Complications Following Experimental Extracorporeal Circulation. D. G. Taylor and J. B. Cavanagh. *Guy's Hosp. Rep.*, Lond., 1958, 107: 207.

The occurrence of signs and symptoms suggesting damage to the brain in experimental animals following extracorporeal circulation led to a planned experimental cardiopulmonary bypass with a bubble oxygenator of the de Wall-Lillehei type. The unmodified de Wall-Lillehei bubble oxygenator was used in all of these experiments. After the induction of anesthesia and the insertion of the venous cannulae into the superior and inferior vena cavae, the bypass was started and the venous blood withdrawn by syphonage. The perfusion rates varied from 30 to 60 ml./kilo./ minute and the complete bypass was generally given for 30 minutes. The mean systemic blood pressure was monitored in all instances. In one dog the superior vena cava and the azygos vein were completely occluded for 3.5 minutes to determine the possible responsibility of high venous pressure for cerebral changes. At periods varying from 6 hours to 3 weeks after the bypass, the brains were removed, suspended in 10 per cent formaldehyde-saline solution, and when hardened were sliced coronally at 0.5 cm. intervals.

Thirteen animals were used in this investigation, and their general physical condition on recovery from operation was good. Signs of neurological abnormality were present in 4 animals and in one of these the signs suggested severe damage. Fixed nonreacting pupils with absent corneal reflexes were observed in 2 animals, both of which died within 8 hours of operation. In one animal generalized spasticity and a "march reflex" was noted and this animal died within 10 hours. One animal had a right torticollis which persisted throughout the survival period of one week, and only in this animal did the brain show changes visible to the naked eye, i.e., an infarct in the right thalamus.

Except for the mentioned instance, gross structural changes in the brain sections were not visible to the naked eye, although they were readily seen with a hand lens. The lesions, which showed a progressive histologic pattern characteristic of anoxia, developed into focal areas of necrosis. The topographical distribution of these lesions was inconstant, occurrence with regularity being noted in both cortex, white matter, thalamus, and cerebellar cortex. In all instances the brain stem was free from these lesions. The lesions were 1 to 2 mm. in diameter, with the exception of the thalamic infarct. No thrombotic or foreign material was discovered in the lumen of any vessel, although the size, location, and appearance of these changes suggested an embolic origin. The lack of importance of high venous pressure was suggested by the absence of lesions in the one animal in whom venous hypertension had been induced.

No attempt was made in this study to indicate what single factor or combination of factors was responsible for the cerebral damage. Three possible sources of emboli were discussed, namely, antifoam gel, fibrin, and air emboli. No definite conclusions regarding any of the three were reached.

In 10 of the 13 animals these areas of multiple focal necroses were found and were attributed to small emboli. There was poor correlation between the number and extent of the lesions and the occurrence of physical signs of cerebral disorder in the animals. In a few human brains examined after total bypass, histologic brain changes similar to those recorded here experimentally have been observed.

—*E. Thomas Boles, Jr., M.D.*

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

The Value of Laminography in Carcinoma of the Larynx (L'importanza della stratigrafia nello studio dei carcinomi laringei). E. GANDOLFO, G. SECONDO, and A. OTTOBONI. *Radiol. med.*, Milano, 1958, 44: 1137.

THE AUTHORS review the anatomy of the larynx and the pathology of carcinoma of the larynx and discuss the mode of spread of this type of carcinoma. Tomographic studies were carried out in patients with carcinoma of the larynx and the authors believe this technique is of value in determining subglottic extension of the tumor although they admit that the diagnosis of cancer can only be made by biopsy.

—Alexander J. Conte, M.D.

Vertebral Artery Angiography in the Diagnosis of Neurosurgical Lesions (L' artériographie vertébrale dans le diagnostic neuro-chirurgical). G. RUGGIERO, A. THIBAUT, and J. BORIES. *Acta Radiol.*, 1958, 50: 365.

THE AUTHORS review 227 vertebral artery angiograms performed on 215 patients from March, 1953 to January, 1958. The patients were divided into 3 groups. In 79 patients, the procedure was performed between 1953 and 1954. In the second group, consisting of 100 patients, the angiograms were done between 1954 and 1956. In the third group of 48 patients, the procedures were carried out between 1957 and January, 1958. The authors point out that in the first group there was a 12 per cent incidence of failure of the examination, whereas in the second group, the incidence of failure was only 4 per cent. There were no failures in the third group. Therefore, the over-all incidence of successful examinations in the last two groups was approximately 97 per cent.

The authors used the percutaneous method. They comment that their results compare very satisfactorily with those of other workers, such as Radner and Hauge who using the catheterization method reported an incidence of 98 per cent of successful examinations. While pointing out that the percutaneous method compares favorably with the catheterization method, they underscore the fact that a certain amount of experience with the procedure is necessary. In this respect it is noteworthy that the last 100 procedures in their series were carried out by the same person. In the authors' opinion, the type of needle used or the type of contrast media injected is of little importance. They use a plain needle with a short bevel instead of the modified Sheldon needle with a lateral hole. The caliber of the needle is not given. The procedure is carried out under local anesthesia with heavy premedication. Complications directly attributable to the procedure have been few in number. Two deaths in the series were only indirectly related to the examination per se. In 2 epileptic patients, the injection provoked an epileptiform attack. In one patient with generalized arteriosclerosis the injection was followed by transitory hemiparesis which regressed within 2 weeks. One patient had paresis of the upper extremity on the same side as the cerebral lesion shortly after the injection. The paresis regressed in 48 hours. There were no complications at the site of puncture.

In their series of patients, there were 18 with vascular lesions of various types. In all of these, the angiograms were of considerable value by supplying information on the abnormal blood supply, collateral circulation, and location of the lesion. There were 78 patients with cerebral tumors. Vertebral artery angiography was found to be extremely useful in the diagnosis of supratentorial and infratentorial tumors. In lesions of the posterior fossa, the authors obtained the best results in extracerebral tumors located in the anterior portion of the posterior fossa and in cerebellar tumors. Of 15 tumors located in the anterior portion of the posterior fossa, a diagnosis of location, situation, and nature was made 7 times, and a diagnosis of location and situation was made 4 times. The diagnosis was based mainly on vascular displacement. On the other hand, in cerebellar tumors, the diagnosis was based mainly on abnormal blood supply. In 14 cerebellar tumors, a diagnosis of location was made 8 times, whereas a diagnosis of location, situation, and nature was made only 3 times. Vertebral artery angiography was of least value in midbrain lesions.

In the authors' hands vertebral angiography has become, like carotid artery angiography, a routine examination and they do not hesitate to carry it out every time that a lesion of the posterior fossa or posterior region of the brain is suspected. In these lesions, the information given by carotid artery angiography is often insufficient unless the lesion is well vascularized. When the clinical examination or encephalogram indicates the existence of a cerebral tumor, it is worth while to carry out a vertebral artery angiogram. If the lesion is vascular it can be localized very precisely and a stereotactic procedure can be considered. In tumors located in the region of the sella, a vertebral angiogram may be useful by indicating the posterior extension of the tumor and its relation to the pons. The filling of metastatic lesions by the contrast media will depend on the degree of blood supply to the metastatic focus. *—René B. Menguy, M.D.*

Demonstration of Aortic Branches with the Aid of a Percutaneous Catheter; Indications and Results (Die isolierte Angiographie der Aortenaeste mit perkutan eingefuehrtem Katheter, ihre Indikation, und Ergebnisse). G. GOLLMANN. *Fortsch. Röntgenstrahl.*, 1958, 89: 383.

FOLLOWING the administration of local skin anesthesia the femoral artery is punctured with a thick needle and a wire is pushed through the lumen. After the needle is removed a polyethylene catheter is inserted over the wire. When it reaches the desired position the wire is removed and the contrast medium is injected. For examination of the branches the straight catheter is replaced by a curved one, which presses against the aortic wall until it gets into the intended aortic branch.

Angiography helps in many cases to differentiate between benign and malignant tumors. Circumscribed tumors with displacement of the vessels indicate benign lesions. Atypical vessels, arteriovenous fistulas, and poor demarcation of the tumor point to malignancy.

A renal arteriogram shows the capillary phase better than an ordinary injection into the aorta. Also much less contrast material is necessary.

In splenoportography an injection of the celiac artery through the splenic artery is more advantageous than parietal splenoportography because (1) there is no danger of bleeding from the point of needle entrance, (2) the entire spleen is visible, (3) there is no injury to the spleen parenchyma, and (4) the splenic artery and vein are visible simultaneously.

The subclavian and vertebral arteries can also be reached from the femoral artery.

Approximately 700 percutaneous femoral angiographies were performed without complications, except for one patient in whom a hematoma developed at the injection site.

Nineteen roentgenograms and several sketches are included. —*Victor R. Jablokow, M.D.*

Tilt Phlebography; A Reliable Method for Diagnosing Incompetent Communicating Veins. FRITS R. MATHIESEN. *Acta radiol.*, Stockh., 1958, 50: 430.

THE AUTHOR briefly reviews the literature concerning various methods of retrograde phlebography and compares his method of procedure with that of Massell and Ettinger in cases of incompetence of the communicating veins. His method is as follows:

1. The injection must be performed rapidly with approximately 40 c.c. of contrast medium and within less than 20, and preferably 10, seconds after a tourniquet is applied above the malleoli.

2. Immediately after vena puncture the radiographic table is tilted to the horizontal position and the injection is temporarily fixed with compression with cotton and elastic adhesive tape to prevent retrograde bleeding.

3. At least two sets of roentgenograms must be taken in the same projection in order to demonstrate the direction of filling in the communicating veins in the erect projection. Two radiographic tubes and generators are used, the films being exposed rapidly in the anteroposterior and lateral projections.

4. Exposures of the roentgenograms must be completed within 30 seconds after tilting of the table.

5. Tourniquets are applied at the level of the thigh, close to the groin, tight enough to compress the great saphenous vein, and, as indicated above, at the level of the malleoli.

Since 1952 the author has performed 687 phlebographic examinations in 470 patients. Of the 687, 30 gave normal results and 34 of the individuals gave a history of deep thrombosis. The remainder had primary varicosities and in these patients the communicating vessels were examined.

The procedure described usually gave excellent visualization of the superficial and deep circulation as well as of the intercommunicating vessels, and frequently gave excellent visualization of the iliac veins to the level of the inferior vena cava. No significant reaction occurred and few sources of error in interpretation were noted.

The sequelae of deep venous thrombosis as noted with tilt phlebography are as follows: (1) absent or incomplete filling of the deep veins (except for the anterior tibial veins) and passage of the contrast medium to the superficial veins, (2) an absent or possibly deficient pattern of the valves in the deep veins, and (3) irregular caliber of the deep veins and thin, net-shaped muscular collaterals.

Several unusual results of tilt phlebographic examinations of undetermined etiology were noted during the series, and the author indicates that he will report further on them. —*Moris Horwitz, M.D.*

Abnormal Bone Formation After Fracture of the Transverse Process (Ueber Knochenspangen nach Queffortsatzfrakturen der Lendenwirbelsaeule). C. ESSER. *Fortsch. Roentgenstrahl.*, 1958, 89: 579.

THE PECULIAR BONE FORMATION found between transverse processes is usually explained as congenital variation. It is assumed that these abnormally placed bony bridges correspond with the massae laterales of the sacrum and represent partial sacralization. The author presents a case in which there was a bony bridge between L2 and L3 with formation of a new joint space, a continuous bridge between L3 and L4, and a partial bridge between L4 and L5. In addition, the intervertebral disc between L3 and L4 was markedly damaged, as represented by narrowing of the intervertebral space. Roentgen studies also revealed torsion-scoliosis of these vertebrae.

These changes (damaged intervertebral disc, torsion, and scoliosis) involving the vertebrae ankylosed by the bony bridges, by necessity must have taken place prior to the ankylosis. Therefore, they could not be of congenital origin. When examined carefully, the roentgenograms revealed deformities of the corresponding transverse processes, consistent with old fractures. The patient gave a history of severe trauma to his back 7 years prior to the present roentgen study. The patient's chief complaint was severe back pain.

The author concludes that this case casts considerable doubt on the congenital cause of these deformities. He believes they are late sequelae of fracture of the transverse process. —*Gunars Medins, M.D.*

Concerning the Differential Diagnosis of Tumors. Case Report: Postoperative Cicatrization of Head of Pancreas or Carcinoma (Zur Differentialdiagnose von Geschwultskrankheiten. Mitteilung: Postoperative Verwachsungen—Pankreaskopf—Karzinom). H. J. MAURER and A. SCHREIBER. *Fortsch. Röntgenstrahl.*, 1958, 89: 566.

IN PREVIOUS REPORTS, cases have been described in which a tumor was "masked," i.e., the person making the diagnosis was misled by the presence of an outstanding disease. This is especially common in cases of tumors of the abdomen when there has been a recent negative examination.

A case is reported in which, following a cholecystectomy, an almost classical picture of carcinoma of the pancreas was mistakenly considered as due to postoperative cicatricial tissue. Following 3 months of conservative treatment, a second laparotomy was

done because of retention vomiting. Extensive scar tissue was found in the right upper quadrant, but the head of the pancreas was also hard and enlarged. Histologic examination revealed a solid medullary carcinoma with metastases in the precolic lymph nodes.

In the differential diagnosis of duodenal stenoses, adhesions from ulcers of the duodenum, pericholecystitis, and perforating gallstones should first be considered. Cancer of the pancreas, of the papilla of Vater, and the duodenum, and retroperitoneal tumors (Hodgkin), are second possibilities. Conditions mentioned by other workers include tumors of the right kidney and adrenal, retroperitoneal lymph nodes, hernia of the ligament of Treitz, megaduodenum and congenital spastic stenoses, pericholecystic scar formation, tumors of the duodenum, gallbladder, right kidney, and the colon, as well as abscesses and arteriomesenteric obstruction involving the intestine.

Beeler and Kirklin have reported an extensive examination of 167 cases of carcinoma of the pancreas of which only 70 had positive roentgenologic symptoms, such as deformities, filling defects, stenoses, or ulcerations. In general, the literature about roentgenologic diagnosis of diseases of the pancreas is very limited. This is possibly because of the absence of symptoms, especially in early cases, and of the rarity of this disease.

In their case, the authors were led astray by a previous operation with negative abdominal findings and they diagnosed a stenosis due to postoperative adhesions. This is further proof that masked malignant tumors associated with negative exploration of the abdomen can frequently cause a wrong diagnosis by both medical and surgical examiners.

—*Alfred H. Noehren, M.D.*

The Value of Intraosseous Venography in Tumors of the Female Pelvis. FRANZ P. LESSMANN and GRACE M. WALDROP. *Acta radiol.*, Stockh., 1958, 50: 501.

THE AUTHORS, who have previously discussed the use of intraosseous venography and roentgenographic findings in involvement of the azygous vein in diseases of the chest and mediastinum, of the vertebral plexus in lesions of the spine, and in pathologic conditions of smaller bones, presently discuss the value of intraosseous venography in the demonstration of vascular displacements, infiltration by carcinoma of the cervix, and local extension. The early detection of recurrence in the pelvis is also discussed.

The method consists of the simultaneous injection into the greater trochanters of 25 c.c. of hypaque solution for the demonstration of the hypogastric vein, external iliac vein, the obturator plexus through the circumflex femoral vein, and the common iliac veins. The femoral and circumflexed femoral veins are also frequently demonstrated, as is the inferior vena cava. The procedure is carried out under sedation with seconal, morphine, and scopolamine, followed by local anesthesia over the femoral areas with 1 per cent procaine. Bone marrow needles are introduced into the marrow cavities and after preliminary film localization, an injection of 1 or 2 c.c. of a contrast medium is made to localize the needles definitely. The bilateral injection of the opaque solution is carried out simultaneously. Although no rapid cassette changer was used, three or four roentgenograms were obtained; the first was taken after approximately 12 c.c. of the material had been injected, the second after 25 c.c., and one or two roentgenograms were taken after the injection was completed.

Follow-up roentgenograms were also made in many instances 6 to 8 hours after the injection and showed no evidence of residual contrast medium at the site of injection.

Complications were not noted and the only reaction experienced by the patient was that of localized pain during the injection and for a short while thereafter. Contraindications to this procedure are those of sensitivity to the local anesthetic and to the contrast material. It is also thought that acute pelvic inflammatory disease and advanced age are no longer contraindications to carrying out the procedure of intraosseous venography.

There was excellent correlation between the radiological interpretation and the surgical or pathologic examination of the site in question.

—*Moris Horwitz, M.D.*

MISCELLANEOUS

Enzymatic Aspects of the Serum of Patients with Malignant Neoplasm of the Genital Tract in Relation to Cobalt-60 Therapy; Glutamic Oxalacetic Transaminase Activity (Aspetti enzimatici del siero della portatrice di neoplasia maligna dell'apparato genitale in relazione con la tele-cobalto 60-terapia; Attività glutammico-ossalacetico transaminasica). G. SANTONI. *Ann. ostet. gin.*, 1958, 80: 387.

THE AUTHOR, after a review of the literature on the effects of radiation on tissue metabolism, presents a study of serum glutamic oxalacetic transaminase activity in a group of women with malignant neoplasms of the genital tract before, during, and one month after cobalt-60 therapy. The group included a total of 109 women. Twenty healthy controls showed a mean glutamic oxalacetic transaminase (G.O.T.) activity of 16 units and 20 patients with genital neoplasms a mean activity of 20 units. The mean G.O.T. activity during treatment in 15 patients receiving 135 to 1,350 roentgens was 27 units, in 15 patients receiving 1,350 to 2,700 roentgens was 40 units, in 12 patients receiving 2,700 to 4,050 roentgens 41 units, and in the group of 12 patients receiving 4,050 to 5,400 roentgens the G.O.T. activity was 35 units. Approximately one month after cobalt-60 therapy, the mean transaminase activity in 15 patients was 20 units. The highest levels of G.O.T. activity observed in 2 patients during therapy was 60 units. The serum G.O.T. activity was determined by the spectrophotometric method of Karmen.

The author suggests that the increase in G.O.T. activity observed during therapy is due to the effect of radiation on the cells. The enzyme is set free from the cells undergoing regressive or necrotic changes. The rather modest elevations of G.O.T. activity that are observed during therapy could be related to the relatively low enzymatic content of the neoplastic cells and of the genital tract.

—*Franco F. Sangalli, M.D.*

Lethal Whole Body Irradiation: Some Experimental Issues. PETER ILBERY. *Med. J. Australia*, 1958, 2: 596.

THE AUTHOR indicates that considerable progress has occurred in radiobiology since the explosion of the first nuclear weapon. He indicates that the original goal of the studies was that of protection of human beings against the radiation energy.

During the course of the studies with experimental animals, particularly mice, it was found that hemopoietic homografting following lethal total body irradiation indicated a possible cure of mouse leukemia. While it is true that considerable success in the treatment of mouse leukemia has been achieved by means of homografting, it is indicated that this treatment is not totally applicable to human beings and that considerable research must yet be done before the method can be adapted to man.

The mechanism of chromosomal and genetic application of homografting is very well discussed, and its possible application in the future treatment of human leukemia is mentioned. The problems inherent in the treatment of human leukemia with this method are very ably described by the author.

—Moris Horwitz, M.D.

The Danger of Exposure to Ionizing Radiation (Die Gefaehrdung durch ionisierende Strahlungen). A. ZUPPINGER. *Schweiz. med. Wschr.*, 1958, 88: 1171.

WHEN ONE ROENTGEN UNIT of radiation is absorbed in 1 c.c. of water, 94 ergs (1 rep) of energy are released. At the site of this energy turnover, ion pairs are formed. Electrons are freed from any molecules which may be in solution, which leaves them with a positive charge. Chemical or thermal reactions are the direct results of this effect of radiation. In addition, "radicals" are formed. The water molecule is divided into an OH and H which have no electrical charge and are extremely reactive. Oxidation-reduction, hydrolysis, polymerization, or depolymerization may take place as a result of their presence. Because of these physical and chemical changes, the biological effects of radiation occur. The harmful biological effects of radiation may be somatic, genetic, or congenital.

Basically, the somatic effects of radiation consist of regressive changes followed by a hypertrophic reaction. This is typified by the reaction of skin to radiation. A SED (skin erythema dose) of radiation corresponds to about 700 roentgens. After an early period of erythema, 8 to 10 days, the irradiated area of skin becomes red, epilated, and brown over a 6 week period. After several months the area will heal over. Nonetheless, it constitutes an injured area as evidenced by its increased susceptibility to additional irradiation. Late changes in the form of pigmentation, telangiectasis, and atrophy are common. Changes of a similar kind take place in all tissues which are irradiated. Chronic radiation dermatitis is often the site of malignant degeneration and all chronic radiation ulcers should be considered precancerous.

The period of latency shown by damaging amounts of somatic radiation is largely determined by the dose. The time factor is also important. By fractioning a dose of radiation over a period of time, three to four times more radiation can be given.

Radiation sickness can appear several hours to a day after radiation. It is a nonspecific reaction. Small exposures to radiation do not produce characteristic changes in the blood. Variations in the hemogram are therefore useless as indicators of minor radiation damage. However, when the leucocyte count drops to 3,000, special care should be taken. A white count under 2,000 requires interruption of radiation therapy. Total exposure to radiation is, comparatively speaking, much more dangerous than local exposure. In man, a total exposure of 400 roentgens will produce a 50 per cent mortality. When this same dose is applied locally, the irradiated area will invariably heal over completely. If a total exposure to 200 roentgens is sustained, the expectancy of leukemia increases tenfold.

Except for situations which might be encountered in an atomic war, the greatest damage that exposure to radiation can produce is genetic in nature. The mutations of genes are the most significant changes which occur. These mutations usually result in recessive traits. There is, most probably, no permissible exposure, genetically speaking, and no recovery factor. In man, an exposure of 30 to 40 roentgens doubles the mutation rate. Natural sources of radiation account for a yearly exposure of 100 microroentgens and it is estimated that double this dose would still be tolerated. However, the largest source of excess radiation due to civilization is the medical use of radiation, primarily that used in diagnosis. Despite the fact that in the whole population the radiation received for medical purposes lies well within the permissible limits, vigorous attempts must be made to keep the dose as low as possible. It must be remembered that it is not so much a question of the isolated individual as that of the gene composition of the whole population that is in danger. As far as permissible exposures are concerned, one must strongly differentiate between the whole population and the radiation personnel. The latter must adhere to simple precautions in order to keep exposure to a minimum.

Damage to the embryo occurs through a combination of somatic and genetic influences of various forms. The greatest danger is in the first 2 months of pregnancy. One should therefore not carry out any x-ray examination, especially not of the pelvic organs, during this period unless strictly necessary.

—J. C. Rosenberg, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

The Electrolyte Balance in the Surgical Patient (Die Bedeutung des Mineralstoffwechsels in der Chirurgie). E. CARSTENSEN. *Chirurg*, 1958, 29: 536.

THE BASIC CONCEPTS of fluid and electrolyte physiology and pathology are reviewed. The author reports 80 cases of major surgical procedures (cholecystectomies, abdominoperineal resections, pulmonary resections, thyroidectomies, and radical mastectomies) in which postoperative electrolyte shifts were determined. All 80 patients had an uneventful postoperative course.

In the absence of complications, such as peritonitis, ileus, fistula formation, only the usual and uniform electrolyte shifts occurred. Potassium was lost during the first and second postoperative days and reached the lowest level on the third and fourth days, but almost never reaching levels below 4.0 mEq. At the end of the first week the serum levels were normal again.

Also other electrolytes, such as sodium and chloride, did not show considerable deviations which could influence the recovery. The patients received only glucose and fructose solutions during and after surgery. Therefore, the author concludes that in the absence of postoperative complications, electrolyte replacement is not necessary. —*Gunars Medins, M.D.*

Infectious Complications After Local Application of Prednisolone (Bericht ueber die Infektionsgefahr nach oertlicher Prednisolon-Therapie). R. KOS and J. VOTIN. *Zbl. Chir.*, 1958, 83: 2044.

AFTER A THOROUGH REVIEW of the literature the authors report 6 cases of infectious complications after the local application of prednisolone. One hundred case histories of prednisolone-treated patients were reviewed. Prednisolone was administered 292 times. Six infectious complications were observed.

Three of the complications were purulent arthritis which followed intra-articular injections in the knee joint. Two complications consisted of local infiltration into eczematous areas around varicose ulcers. One injection was made into an organizing hematoma of the ankle region.

The bacteriological findings were Staphylococcus aureus—3 cases, Proteus—1 case, Escherichia coli, and Pseudomonas aeruginosa—1 case. All of the patients responded well to surgical and antibiotic therapy. The intra-articular and the intrahematoma injections were regarded as fully iatrogenic (resistant Staphylococcus). The infiltration into the eczematous areas were considered as flare-ups of previously smoldering infectious processes. Only since local steroid therapy was introduced have the authors observed such an increased incidence of infections after local application. They concluded that the previously adequate aseptic measures did not suffice for steroid application. They stressed a sharp lookout for this complication, more rigid asepsis, and possibly antibiotic prophylaxis. —*Gunars Medins, M.D.*

Hemorrhagic Diatheses and Thromboplastic Deficiency (Diathèses hémorragiques et déficience thromboplastique). MARC VERSTRAETE. *Sem. hôp. Paris*, 1958, 34: 2741.

THE EXPERIENCE here reported was gained from 46 cases of hemorrhagic diathesis, cases which could be classified under the denomination of the "hemophilic syndrome." The patients had usually come to the author's service at the University of Louvain in Belgium, complaining of some form of bleeding, most often following dental extractions.

The tests used in the study of these bleeders bear such familiar names as Lee and White, Duke, Rumpel-Leede, Van Goidsenhoven, and Biggs and Mac Farlane. The majority of the articles are in English and mentioned in the bibliography of the original text.

Of the 3 phases of the coagulative process, the first or thromboplastin, the second or thrombin, and the third or fibrin phase, the author here treats only of the first.

The form of hemorrhagic diathesis resulting from retarded or incomplete formation of plasma thromboplastin has a number of causes. The first cause discussed is the deficiency of the antihemophilic factor (VIII), which leads to the development of the so-called type A hemophilia. This affects chiefly males; however under certain rare conditions, females may also be affected. For instance, the A type of hemophilia has been reported in homozygotic females, that is, daughters of a type A hemophiliac and a mother who is the bearer of a type A hemophilic gene. The type A hemophiliacs comprised 37 of the author's 46 patients. In the author's opinion the most reliable test for this particular type of the malady is that of the formation of thromboplastin (Biggs and Douglas) and represents a differential test for the deficient factor. The test for heparin tolerance, as described by the author *et al.*, depicts clearly the condition of hypocoagulability, but is not reliable as a differential sign.

The second cause discussed is deficiency of the so-called Christmas factor, or factor P.T.C. (IX), which leads to the so-called type B hemophilia. The important difference between the 2 types of hemophilia lies in the fact that the B type lacks a factor in the serum which is present in the serum and the plasma of the patient with the type A hemophilia in normal amounts, and the factor in the blood which is deficient in the A type of hemophilia is normal in the patient suffering from the B type of hemophilia. The author's material contained 4 cases of type B hemophilia. The differential diagnostic tests and treatment of Christmas disease will be found in the original article by Rosemary Bigges *et al.* in the *Brit. M. J.*, 1952, 2: 1378, and in abstract form in the *Internat. Abstr. Surg.*, 1953, 97: 207.

The third cause discussed is deficiency of the factor plasma thromboplastin antecedent (P.T.A. factor) which leads to the condition known as type C hemophilia. The deficient factor which leads to a milder

form of hemorrhagic diathesis than that of Christmas disease is linked to sex by a dominant gene, as is factor IX. In fact these two factors differ only slightly in their physicochemical properties and occur in the same plasma protein fraction (Rosenthal *et al. Proc. Soc. Exper. Biol. and Med.*, 1953, 82: 171, and *J. Lab. Clin. Med.*, 1955, 45: 123). The author, apparently, did not encounter any instances of this condition in his material.

Finally, the author discusses the genetic implications in one of his patients who was suffering from a combined deficiency of factors which led to both the type A and type B hemophilias. This case has already been discussed by the author *et al.* (*Brit. M. J.*, 1955, 2: 1533), and his considerations with reference to the endogenous circulating anticoagulants have been published in the *Acta med. scand.*, 1956, 155: 37.

—*John W. Brennan, M.D.*

Peutz Syndrome: Perioral Pigmentation and Polyposis of the Intestinal Tract (Das Peutz-Syndrom: periorale Melaninflecken und multiple Intestinalpolypen, ein praktisch-wie theoretisch-bedeutsames Krankheitsbild). S. DORTENMANN. *Medizinische*, 1958, 49: 1992.

SINCE the first report by Peutz about 75 cases of perioral pigmentation and polyposis of the intestinal tract have been in the world literature. The signs and symptoms include dark complexion, dark hair, pigmented spots around the mouth, on the lips, and on the oral mucosa, plus polyps within the intestinal tract. The predominant sites of the polyps are the jejunum and ileum. Occasionally the large intestine, rectum, and stomach showed polyp formation. The patients usually required medical attention in their second and third decades, when chronic anemia due to occult bleeding, and acute abdominal symptoms due to intussusception of the polyp containing segments of the small intestine were observed.

One case report concerned a dark-complexioned, 19 year old girl with perioral pigmentations who in June 1957 had an emergency laparotomy for acute intestinal obstruction and palpable abdominal tumor. At surgery intussusception of the ileum was found to involve about 200 cm. of the ileum. Within this segment a polyp was found; 30 cm. of the intestine were resected. Seven days postoperatively the patient had to be reoperated upon because of recurrent intussusception. An ileal segment further distally was involved and found to be partially gangrenous. Fifty centimeters of the small intestine were resected and they also contained a polyp. The entire intestinal tract was then palpated and another polyp was felt in the area of the splenic flexure. Because of the poor general condition of the patient it was decided to remove the colonic polyp at a later date. It was done 3 weeks later. Six months later the patient returned for x-ray study of her gastrointestinal tract. Another polypoid lesion was discovered within the terminal ileum. At surgery it was removed by ileocecal resection. Another lesion was found within the terminal jejunum and removed by local excision. The past history of this patient revealed recurrent abdominal colic since earliest childhood. In 1953 a small bowel resection was performed for intussusception caused by a polyp.

The pathological diagnosis of the polyps was papillary adenoma of the small and large intestine. The two polyps of the small bowel removed in 1957 showed invasive growth into the intestinal wall; however, the cellular structure showed excellent differentiation, but no grossly destructive growth was noticed. The author cites Bartholomew, Dahlin, and Waugh from the Mayo Clinic in whose collective review of the world literature 14 cases presented similar quasi-malignant changes without clinical cancer. Therefore, it was concluded that possibly these lesions represent hamartomas and not carcinomas.

The following therapeutic plan is recommended:

1. If an emergency procedure must be performed because of obstruction or intussusception, local resection of the involved segments with careful survey of the intestinal tract for further polyps is recommended.

2. If further lesions are found during later x-ray studies, elective resection is to be performed.

3. In cases of multiple polyposis prophylactic resection of a large jejunal or ileal segment is to be considered, provided the lesions are exclusively confined to one area of the small intestine. This policy, however, could become dangerous if after the sacrifice of a large area of resorptive surface another segment of the small intestine would develop polyps.

—*Gunars Medins, M.D.*

Experimental Skin Grafts Pretreated with Carcinogens (Ueber Transplantationsversuche cancerogen behandelter Hautlappen beim Kaninchen). A. GRAFFI, J. GIMMY, and F. SCHARSACH. *Arch. Geschwulstforsch.*, 1958, 14: 50.

THE EXPERIMENTS in this study were devised in an attempt to determine if carcinogenic agents produce proliferation by direct effect on the cells or through some indirect means. Rabbits were used. A skin area 6 by 8 cm. in diameter was pretreated 15 to 20 times with a 0.5 per cent 9,10-dimethyl-1,2-benzanthracene solution in acetone. After 30 to 40 days an area of skin was excised on the contralateral side of the animal's body and a light metal frame sutured to the skin edges to prevent re-epithelization. Thin, autologous, split-thickness skin grafts were then transplanted from the carcinogen pretreated area. Penicillin was applied topically to the recipient site and dressings applied. Later a 5 to 10 per cent croton oil solution in acetone and paraffin was used to achieve a maximum realization of the tumor 'anlage' in the graft. The number of tumors appearing in the transplantation site versus the time of occurrence was tabulated. A steady increase of tumor development was noted up to the eighteenth month with a maximum at this time. A similar incidence was found on the donor site.

The results indicate that the tumors originated from the transplanted skin since epithelization from the normal surroundings was prevented. It could not be determined if carcinogenesis acts in some way through the connective tissue, since the skin grafts included the upper layers of the corium. The possibility that some carcinogenic material was transferred to the recipient site and caused local carcinogenesis was controlled by discontinuing the painting of the donor site 2 to 3 weeks prior to transplantation. A

possible distant effect of the carcinogen was excluded by controlled experiments in which one area of skin was treated with the carcinogen and another with croton oil. In no instance was tumorigenesis observed in the croton oil treated skin.

—*Karel B. Absolon, M.D.*

A Rare Case of Benign Glomangioma of the Left Anterior Femoral Region (Sôbre um caso excepcional de glomangioma benigno da região femoral anterior esquerda). PEDRO JORGE and ÉZIO CAVALIERI. *Rev. med. mun.*, Rio. 1958, 25: 247.

THE PATIENT was a 38 year old colored woman who complained of pains and a tumor in the region of the left thigh. The pains were spontaneous but became worse during childbirth, influenzal infections, and emotional disturbances; they radiated to the knee, the leg, and the coxofemoral articulation, and made walking difficult. There were no other findings and the patient was unable to say just when the manifestations had first occurred.

At operation an 8 by 5 cm., 120 gm. tumor was uncovered in the muscular plane (between the sartorius, quadriceps, and adductor muscles of the left thigh). It was surrounded by a dense capsule whose extremities were firmly adherent to the muscular structures. The tumor mass was easily removed, the convalescence was without incident, and the patient has since been perfectly well.

On cut surface the oval neoplastic mass was translucent, of diminished consistency, and traversed by delicate strands of stroma. In one of the poles an area of ash-gray color with blackish stippling was noted.

Histologically, the specimen on cross-section exhibited abundant vascular structures of variegated size and shape. Enveloping these vascular structures were thick walls of muscular tissue which were infiltrated with cells of epithelioid type with spherical nuclei and a moderate amount of cytoplasm. Nerve fibers were also observed, some of which were coarse and stained with hematoxylin-eosin, while others were finer and demonstrated only by the silver-impregnation method of Masson and Gomory. The stroma in some areas exhibited a moderate grade of fibrous hypertrophy. A diagnosis of benign glomangioma was made.

Of great interest, of course, is the unusual location of this neoplasm, a problem which involved the histogenesis of the tumor. The authors agree fully with Lôbo, who ascribes the origin of the tumor to the pericytes of Zimmermann or cells of Rouget, that is, those fibrocellular contractile elements encircling the capillaries, the precapillary arterioles, and the postcapillary venules which are conceived of as fibrocellular, vascular, smooth muscle fibers.

The authors believe they have contributed to the support of the aforementioned theory since they have demonstrated, histologically, transitional forms between the muscle walls surrounding the intratumoral blood capillaries and the epithelioid cells infiltrating these surrounding muscular walls. They think this histogenetic theory explains the occurrence of the tumor at this odd location and, indeed, would explain the development of such a tumor at practically any location in the body. —*John W. Brennan, M.D.*

Neurological Syndromes Associated with Carcinoma. RUSSELL BRAIN and R. A. HENSON. *Lancet*, Lond., 1958, 2: 971.

THE AUTHORS point out that it has been known for a long time, but not widely appreciated, that the nervous system may become disordered in patients with carcinoma and that this occurs independent of metastatic spread. Their experience totals 42 cases of neurological disorders in association with carcinoma without metastases. Carcinomatous neuropathy may occur at many neurologic levels and muscles may also be involved, which factors make classification difficult. However, the authors classify their cases as follows:

Cortical cerebellar degeneration	8
Mixed forms	7
Sensory neuropathy	5
Peripheral neuropathy (sensorimotor)	5
Neuromuscular disorders	17

The sites of underlying carcinomas were found as follows:

Lung (males 23, females 9)	32
Ovary	4
Prostate	2
Rectum	2
Breast	2
Uncertain	1

There appears to be no constant relationship between the course of the cancer and the course of the neurological disturbance. Even successful surgical removal of the cancer does not necessarily affect the neuropathy.

The clinical and pathological characteristics of these neuropathies are described. Mental disturbances occurred in 17 patients. Treatment has been generally unsatisfactory. Although the etiology of the neurological syndromes remains obscure, yet the authors present an interesting discussion of the theories of causation and the facts that must be accounted for in any satisfactory explanation.

—*Edward F. Lewison, M.D.*

The Behavior of the Sulfhydryls in the Blood Serum in the Presence of Malignant Neoplasms (Comportamento dei sulfidrili del siero nelle neoplasie maligne). W. PAOLINO, L. RESEGOTTI, and S. SARTORIS. *Tumori*, 1958, 44: 337.

THIS STUDY was conducted at the Institute of Medical Pathology of Turin, Italy. There were 24 normal patients (controls), that is, patients with various affections but without evidence of neoplastic disease; 15 patients suffering from bronchial carcinoma; 12 with gastric carcinoma; and 15 with neoplastic lesions of various types and locations.

Determination of the sulfhydryl titer (-SH) of the blood serum was carried out by the method of Kolthoff and Harris, using the rotating platinum electrode, (*Indust. Engin. Chem., Anal. Ed.*, 1946, 18: 161), as modified by Benesch and Benesch (*Arch. Biochem.* N. Y., 1948, 19: 35). The results obtained in the control group were rather uniform and were not markedly affected by the taking of food, or by the presence of anemia, pregnancy, cachexia, or fever.

These findings were, therefore, assumed to be normal and the average sulfhydryl-titer was established as μM. 55 $\pm$ 8.8.

In the 15 patients with pulmonary cancer the sulfhydryl findings were normal in 6, and decidedly below normal in the remaining 9; of the 12 with gastric cancer the findings were normal in only 2 patients and were decidedly below normal in the remaining 10. The authors believe that the greater prevalence of low readings in the gastric cancer group may be ascribed to the fact that the gastric neoplasms are, as a rule, recognized later.

The miscellaneous neoplastic group included 4 prostatic cancers; 2 mammary, 2 pleural, and 2 facial neoplasms; 1 each of cancer of the liver, the nose, and the soft palate; 1 seminoma; and 1 craniopharyngioma. There were 3 normal readings. Of the remaining 12 cases there were 2 in which the sulfhydryl titer was less than 30. There were a certain number of cases with readings slightly below normal.

Thus in the neoplastic groups the readings were normal in 26 per cent; this number tending to comprise those with the less advanced phases of the disease. This does not mean, of course, that the below normal readings postulate the presence of malignancy; however, in the absence of other conditions such as diabetes or icterus which are capable of producing low readings, the subnormal sulfhydryl values lead the diagnostician to suspect a malignant lesion.

Repeated determinations on a patient with a neoplasm do not as a rule show sufficient diversity to make it possible to distinguish phases of the tumor, such as the presence or absence of metastases, or of local infiltrative development. Nevertheless, the impression is had, on occasion, that any type of aggravation of the course of the disease tends to show up as a lowering of the sulfhydryl reading and that quiescence or regression of the process may result in a rise toward the normal level.

In conclusion the authors admit that on the basis of the data obtained from their study, they can not give any explanation for the manifestation of these variations in the sulfhydryl readings of the blood sera, other than to suggest that such behavior may be linked up, in the sense propounded by Kolthoff *et al.*, with that of the sulfhydryl fraction in the blood globulin. The serum fraction is taken up by the globulin fraction of the blood plasma, the determination of which is not practicable at present, in preparation for the application of this absorbed sulfhydryl fraction to the process of neoplastic cellular division.

—John W. Brennan, M.D.

DUCTLESS GLANDS

A Case of Cushing's Syndrome in an Infant. E. Goldblatt and A. H. Snaith. *Arch. Dis. Childh.*, Lond., 1958, 33: 540.

The authors report the circumstance of Cushing's syndrome in infancy treated, they believe, for the first time by bilateral adrenalectomy. The patient, a girl, was normal at 12 months of age, but rapidly over a 2 month period she gained 4 lb. 14 oz. and became increasingly irritable. On examination, the infant was obese with a buffalo hump, the face was plethoric and presented an acneiform rash. There was slight hirsuties of the face and back. No striae were present. The blood pressure was 140/90 mm. (normal average at this age 96/66 mm.) An intravenous pyelogram suggested enlargement of the right adrenal gland. The 17 ketosteroids, 17 hydroxysteroids, and 17 ketogenic steroids were all elevated.

At operation both adrenal glands were found to be slightly enlarged and nodular; the left adrenal gland was removed. After removal of this gland there was a decline in steroid excretion but the clinical condition remained unchanged. The influence of ACTH, fluorohydrocortisone, methyl testosterone, and of stilbestrol on steroid excretion was studied and it was concluded that none of these hormones in the dose given strikingly influenced the secretion by the remaining gland. This would have been expected in a case of adrenal hyperplasia. Microscopic examination of the left adrenal gland revealed multiple adenomatous nodules with intervening areas of atrophic cortical tissues. The right adrenal gland was removed and the patient was maintained on 50 mgm. of cortisone each day, which was gradually reduced. The patient was discharged on a maintenance dose of 20 mgm. of cortisone acetate and 1 gm. of salt each day. At the time of discharge, the patient's appearance had become much more normal. Total adrenalectomy, which is the treatment of choice in the older patient, had been undertaken with the intention of maintaining the patient on cortisone for the rest of her life.

—Lloyd D. MacLean, M.D.

Carcinoma of the Thyroid in Children After X-Ray Therapy in Early Childhood. D. R. Rooney and R. W. Powell. *J. Am. M. Ass.*, 1959, 169: 1.

The authors add 7 cases of thyroid neoplasia following irradiation for benign conditions to 114 cases previously reported by other workers.

It is noted that carcinoma of the thyroid is being diagnosed with increasing frequency in children. This increase in over-all incidence in children is not completely explained by earlier diagnosis. Irradiation of the thymus gland in infancy for enlargement was widely practiced and accepted until 1950. Radiation to enlarged lymphoid structures in the oropharynx, to persistently enlarged cervical lymphatics, and to the chest for chronic cough were also accepted procedures during the same period.

In contrast to the situation seen in children, there have been no reports of thyroid carcinoma in adults after roentgen therapy for laryngeal carcinoma or thyrotoxicosis. The long intervals in some reported cases between roentgen therapy in childhood and infancy and the later development of thyroid carcinoma suggest that a longer follow-up study of series presently reported might yield additional cases.

A history of previous irradiation is difficult to obtain, and care must be taken to avoid alarming the patient's parents. Approximately one-third of all children with thyroid cancer received previous radiation therapy to the head, neck, or thorax. The incidence of this neoplasm in children may decrease in the future, since the practice of irradiating benign conditions in infancy and childhood is decreasing.

—Stuart L. Scheiner, M.D.

EXPERIMENTAL SURGERY

The Influence of Denervation on the Induction of Skin Cancer in Rats and on the Growth of the Guérin Tumor (Der Einfluss der Denervation auf die Hautcarcinogenese der Ratten und das Wachstum des Guérin Tumors). A. Benkö and A. Tiszai. *Arch. Geschwulstforsch.*, 1958, 13: 239.

The authors undertook this investigation to help clarify some of the factors pertaining to the organism that might influence neoplastic processes. Though studies of carcinogenesis and of cancer cells are of great importance, the role of the host animal must also be considered. Pawlow summarized the relationship between the tumor and the organism in the following manner: (1) the growth of tumor cells falls under the control of the organism and is not "autonomous"; and (2) the tumor elicits a response from the organism, via neuroreflexes, which effects changes in the tissues around the tumor.

Studies with respect to the innervation of tumors have not been conclusive. The nervous elements in tumors have been thought to affect solely the blood vessels and not the tumor cells themselves. Contradictory data are also available with respect to the effect of denervation on the growth of tumors. In order to elucidate the role of the nervous system in the neoplastic process, the following study was performed:

The left posterior extremity of 10 rats was completely denervated. A 0.5 per cent solution of dibenzanthracene-benzene was painted over the denervated extremity twice daily. Twelve controls were treated the same way. After 125 days the denervated extremities had a total of 23 induced carcinomas with an average area of 4.63 square centimeters. However, the controls were observed for 152 days and they had 30 tumors of an average area of only 1.5 square centimeters.

In another study, 32 denervated and 30 control rats received 0.5 ml. of a tumor suspension from a Guérin tumor. Within a given time, the average weight of the resulting tumor in the denervated animal was 18.9 gm. The average weight of the tumor in the intact animals was 11.6 gm. The time the tumor took to establish itself in the denervated extremities was 9.43 days. In the intact animals it took 12.7 days.

These data serve to indicate that denervation promotes the induction and growth of tumors. This may be due to the fact that interruption of the nerve supply interferes with the resistance of the mesenchyma. —*J. C. Rosenberg, M.D.*

Coronary Gas Embolism in the Course of Opening of the Left Side of the Heart; Experimental Study of a Preventive Technique (L'embolie gazeuse coronaire au cours de l'ouverture du coeur gauche; étude expérimentale d'une technique de prévention). R. de Vernejoul, E. Henry, R. Courbier, P. Montiès, and P. Rochu. *Presse méd.*, 1958, 66: 1825.

Sixteen adult dogs were used for this experimental study. Through the fourth intercostal space on the left side the chest cavity was entered, the pericardium incised, and the left auricle exposed. Into this cavity was then injected 3 to 8 c.c. (0.3 to 1.5 c.c./kgm.) of carbonic acid gas. Immediately there was the rumbling murmur of the gas in the left ventricle and the coronary artery assumed a pale whitish tint; this vessel, however, became filled with gas bubbles almost immediately which gave a string-of-beads appearance. The further progress of the bubbles could be followed even into the finest branches of the vascular complex.

For a few moments during the progress of the bubbles the myocardium assumed a violaceous color, revealing a marked state of ischemia; this appearance, however, rapidly regressed, the regression being accompanied by a considerable slowing of the heart rate and an important diminution of the myocardial tonus. On occasion ventricular fibrillation has developed at this stage.

Now the cardiac massage was initiated and, if the forward movement of the gaseous bubbles in the coronary vessels did not appear to be rapid enough, the massage was supplemented by a clamping off of the portion of the aorta above the semilunar valves, that is, distal to the level of the branching off of the coronary vessels.

Following the disappearance of the gas bubbles, electric defibrillation of the heart action was carried out when necessary, and the massage of the heart was continued. The regular cardiac rhythm was re-established progressively and the chest was closed with continuous drainage.

Electrocardiographic control during the experiments showed that even before the end of the experiment, the tracing had returned almost to normal.

On the whole, the work has shown that the carbon dioxide embolism is much safer than that produced by air, and that the rapidity of elimination of the carbon dioxide is sufficient to assure recuperation of the myocardial tonus and thus avoid the development of cardiac infarct.

Therefore, it should be possible to open the left auricle under hibernation in order to carry out a rapid surgical intervention on the heart itself without fear of permanent sequelae from gas embolism, provided that the operation has been preceded by the described technique and, even after closure of the chest, the thoracic cavity may be kept filled with carbon dioxide gas, which makes any aspiration of gas from this cavity into the heart inoccuous.

—*John W. Brennan, M.D.*

Experimental Hepatic Regeneration (La rigenerazione epatica sperimentale). A. Dagradi, G. de Candia, and O. Bellini. *Chir. pat. sper.*, Milano, 1958, 6: 801.

In each of 82 adult male albino rats with an average body weight of 140 gm. a subtotal hepatectomy was done, about two-thirds of the liver being removed. The animals were then maintained on their normal diet for varying periods of time. Twenty-eight were sacrificed by exsanguination after 24 hours, 8 after 48 hours, 22 after 72 hours, and 24 after 7 days.

The residual livers with their regenerated tissues were then removed at autopsy and the amount and weight of liver tissue determined. Morphologic, biochemical, and histochemical data were gathered. The mitotic behavior of the regenerated cells was investigated by means of the ordinary hematoxylin-

eosin stain, the lipids with the Sudan black stain, the glycogen with the periodic acid stain of Schiff, the alkaline phosphatase by the staining method of Gomori-Danielle, and the nucleic acids by the method of Lagerstedt (*Acta Anat.*, 1944, 7: Supp. 9) that makes it possible to distinguish between desoxyribonucleic acid and ribonucleic acid.

The authors observed two periods of increased cell division; however, they believe that the second mitotic "push," from the fourth day after the hepatectomy to the seventh postoperative day (end of the period of observation), is merely a response to the increasing needs of the body of the animal, a body which is putting on weight following weight-loss from the stress of the operation and the decreased nutritional supply of this period. The initial push, however, is believed to result from the loss of some inhibitory factor coincident to the loss of two-thirds of the liver tissue, an inhibitory factor which normally stops the multiplying process of the liver cells when the liver has reached its normal size. It is thought that this may have some bearing on the development of neoplasms in general.

The generally accepted notion that the fundamental process in the regeneration of the liver tissue following subtotal hepatectomy is the synthesis of nucleic acid is concurred in by the authors. The early decrease in the amount of glycogen and the early increase in the amounts of the lipids present in the stained sections are suggested to be on the basis of energy-producers or other enzymatic influences, the exact nature of which is not clearly understood.

The authors suggest that the behavior of the alkaline phosphatase indicates that this enzyme has more to do with the differentiation of the cell after it is regenerated than it has with the process of cellular multiplication (synthesis of nucleic acid), that is, that the alkaline phosphatase is active in the mechanism which leads to the formation of the specific protein involved in the process of regeneration.

Thirty-seven illustrative figures, some in color, are included. —*John W. Brennan, M.D.*

HOSPITALS; MEDICAL EDUCATION AND HISTORY

A Note on the Histological Appearances of 3 Kidneys Originally Described by Richard Bright. J. B. CAVANAGH. *Guy's Hosp. Rep.*, Lond., 1958, 107: 390.

UTILIZING MODERN HISTOLOGIC TECHNIQUES, the author reports on the microscopic appearance of 3 kidneys originally described by Richard Bright. Histologic reproductions using methyl violet, hematoxylin and eosin, and the periodic acid Schiff stains are included in this article. The modern classification of nephritis is included with a discussion of the interpretation of each of the 3 cases described by Bright.

The author concludes that Bright left for posterity 2 examples of nephritic disease, one in a relatively early, and the other in an advanced, stage of development, and that he could not have chosen a better pair of kidneys to illustrate the changes in the most important variety of the disease that now bears his name.

—*Lloyd D. MacLean, M.D.*